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A CRITIQUE OF THE OPERATIVE THERAPY OF ANGINA PECTORIS

BASED ON A CASE OF VOCAL CORD PARALYSIS FOLLOWING SYMPATHECTOMY*

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IT is the purpose of this paper neither to present a brief for nor to pass judgment on the operation of sympathectomy, but rather to tell the story of a postoperative complication that for a short time was almost tragic and then, for a longer period, caused an overwhelming amount of discomfort. A single instance of this sort serves as a totally inadequate basis on which to rest any dogmatic principle; it may well serve, however, as a check against unwarranted surgical enthusiasm, or at least as a corrective for numerous statements in the literature concerning the simplicity and innocuousness of the operation of cervical sympathectomy. Just now the crest of a rather typical wave of surgical enthusiasm seems to be flattening a bit and it may be timely to use a single case report as a text for a discourse on differences of opinion concerning the remedial value of operative therapy for the pains of angina.

CASE REPORT

On May 5, 1925, I was called by Dr. A. E. Taussig to see a woman aged fifty-eight years who was suffering with shortness of breath, precordial pain and general weakness. The symptoms had persisted for seven years and during a large part of that time had been accompanied by pulsus alternans. During these seven years she had been hospitalized several times under the care of Dr. Taussig, who had made the diagnosis of chronic myocarditis, auricular fibrillation and mitral insufficiency with angina pectoris. The pain distribution was along the left side. At the time that we saw her, she was particularly distressed by the radiating pains of angina plus a sort of "heart clutch" which, she said, had of late been continuing through twenty-four hour periods without intermission. We both felt that there might be some question regarding the advisability of sympathectomy on account of the high degree of cardiac damage, but we were influenced by a desire to side-track the torturing pain, which had up to then resisted all medical therapy.

On May 29, a left-side cervical sympathectomy was done under ½ per cent novocaine infiltration, preceded by hypodermatic administration of 1/100 grain hyoscine and ¼ grain morphine. The superior cervical ganglion with all its communicating branches, the middle cervical ganglion and the intervening trunk of the sympathetic were removed. At operation, the vascular bundle was located without difficulty and was retracted medially. After a patient search, the sympathetic was not found

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in its normal position, so the sheath of the vascular bundle was dissected on its posterior aspect, thus exposing what seemed to be the sympathetic trunk, closely adherent to what seemed to be the vagus, in the same relationship that exists in the dog. In order to identify these two nerves positively, the pulse was counted while gentle forceps pressure was made on each nerve in turn. The slowing of the pulse rate which follows pressure on the vagus, enabled us to differentiate the two nerves. Then the sympathetic and its two upper ganglia were resected. The patient stood the ordeal of operation well and experienced an immediate relief from the severe anginal pain with which she was suffering up to the time she received her preoperative injection of hyoscine and morphine. The day after operation, however, it was noticed that she could not speak above a whisper. The laryngologist, Dr. E. B. Westlake reported abductor paralysis of the left vocal cord. This paralysis, constituting, as it does, the most important phase of this report, will be dealt with in detail under the head of epicritical remarks. The patient was discharged to a convalescent home nineteen days after operation. Wound healing had been uncomplicated and the patient was inexpressibly thankful for her deliverance from pain. She had the usual postoperative pain radiating to occiput and shoulder but she stood it without a murmur.

About three months later she was readmitted to the hospital complaining of severe substernal pain. This did not radiate to either the right or left side. The patient, motivated by the two months of freedom from pain that followed the first operation, was anxious to have the right sympathetic resected. Dr. A. E. Taussig felt that such a resection was well worth attempting, whereas I was rather distrustful of further surgical interference. After a formal discussion with all the internists of the hospital, it was decided, in spite of the advanced degree of cardiac damage, to resect the right sympathetic nerve.

December 15, 1925 this operation was done. We encountered exactly the same anatomic anomaly that we had met at the first operation, namely the fusion of the sympathetic nerve with the vagus. This time, however, the nerves were separated with the greatest care and gentleness and they were stimulated with a bipolar electrode instead of a forceps pressure. In spite of these precautions, however, when the patient began to emerge from her twilight anesthesia about twenty minutes after her return to bed, she manifested a most alarming dyspnea. It seemed that tracheotomy would be imperative, but fortunately the respiratory mechanism adjusted itself to a degree that made it unnecessary to resort to this emergency procedure. Dr. Guggenheim, then the laryngologist on service, reported abductor paralysis of the right cord. Both cords were now fixed in the position of adduction with an inefficient chink between them.

The patient reported herself free from pain after this operation, but complained bitterly of dyspnea that did not permit the slightest exertion. Indeed, she could no longer, in any trustworthy fashion, differentiate the discomfort of pain from that of dyspnea. Gradually as the cords atrophied, she secured a sufficiently wide chink to breathe quietly in fair comfort at the time of her discharge from the hospital, six weeks after operation. At this time she reported herself free from pain.

Two months later, she was readmitted to the hospital, with symptoms of cardiac decompensation. She did not complain of pain but only of dyspnea. The laryngologist reported that the severe dyspnea was not due to the cord paralysis because there was a sufficient chink to permit of free and quiet breathing. It is reasonable to assume that this dyspnea may have been the result of cardiac decompensation due to the previous sympathectomies. After about two weeks' stay in the hospital, the heart failed and death occurred.

Isakowitz (referred to later) believes that the heart muscle degeneration induced by sympathectomy predisposes to cardiac decompensation.

Epicritical Remarks. Here, then, was a patient suffering with angina pectoris due to a heart so damaged that there might have been reasonable and legitimate doubt regarding the advisability of surgical interference. She was subjected to two operations. The operations were followed by two types of postoperative complications: one type we may characterize as minor because the patient reported herself as content to put up with resultant dis-

comfort in exchange for the chest agony that it replaced. I refer to the radiating occipital and shoulder pains that so frequently follow sympathectomy. The other type was a major complication, a distressing dyspnea which for a while was actually life-threatening. The left cord paralysis was attributed to pinching the vagus too hard with a forceps. This was probably a false conclusion for the right vagus was not pinched and yet a right cord paralysis occurred. The probability is that in separating the sympathetic from its intimate connection with the vagus, some injury was done to the fibers of the recurrent laryngeal nerve as they run in the vagus. How to avoid such injury I do not know, nor do I know how often an anomalous relationship between vagus and sympathetic occurs.

The neck organs of the patient were removed after death. Unfortunately the left vascular bundle was destroyed in the process of embalming. We were able, however, to dissect out the vagus and recurrent laryngeal on the right side. Professor S. W. Ransom of the Washington University School of Medicine kindly undertook to examine the recurrent laryngeal nerve for evidence of degeneration. He found none but he reported that "The Marchi method was not applicable because degeneration, if any, had been in progress too long; therefore, the presence of individual degenerating fibers could not be detected. The Pal-Weigert method showed the nerve apparently normal. It is impossible, however, to say that a few fibers may not have degenerated. One can only say that there is no massive degeneration indicating destruction of the nerve as a whole." Based purely upon clinical findings the inescapable conclusion presents itself that seemingly insignificant trauma of the vagus nerve may compromise those fibers of the recurrent laryngeal nerve that abduct the vocal cords. Even granting the great danger of a bilateral abductor paralysis of the vocal cords, we need not accord too much consideration to this complication in the course of a sympathectomy because trauma to the vagus will always be a more or less unusual incident in this operation. But the fact is demonstrated that it is a complication and we must weigh this complication together with the other ones that have been reported before we can reach any safe conclusions regarding the performance of surgical operations for the relief of angina pectoris. This particular patient reported that she would willingly stand her postoperative discomfort rather than endure the pains of angina. Of ominous significance in this case was the terminal dyspnea, which may have been the result of cardiac decompensation secondary to heart muscle degeneration. As will be seen later sympathectomy may cause degeneration of the heart muscle.

As surgeons, we should be concerned most seriously with two problems: (1) To what degree are we able to overcome the pains of angina pectoris? (2) Are the surgical measures that we employ rational and safe? It would seem that we are not warranted in dismissing with a gesture, the unqualified objections of the late Sir James Mackenzie to cervical sympathectomy; and there seems to be less warrant for accepting at their face value the statements of those surgeons who see no possible harm in the operation, provided the patients are carefully selected. It is difficult to know how much weight to accord to the experience of such a judicious author as Cutler[1] when he says that he has never observed "any deleterious effects on cardiac capacity as a result of operation." It is almost impossible to agree with him when he says that available experimental and clinical evidence demonstrate that such procedures as nerve ablation for angina pectoris "in no way incapacitate the heart."

The fact of the matter is that there is a disconcerting diversity of opinion regarding the type of operation best suited to palliate the pains of angina pectoris, the permanency of results obtained by operat-

ive procedures and the immediate and remote menace to life inherent in the various operations.

Even a cursory survey of the literature emphasizes these conflicting opinions. At the very outset of an inquiry of this sort, one is struck by the fact that no less than ten, and possibly more operations have been devised for the relief of angina pectoris: cervical sympathectomy with resection of the stellate ganglion; section of the depressor nerve; paravertebral block; section of fibers emerging from the vagus; section of the rami communicantes arising from the stellate ganglion; section of the cervical sympathetic above the lowest ganglion with section of the vertebral nerve; section of the sympathetic nerve above the stellate ganglion; cervical sympathectomy without resection of the stellate ganglion; resection of the cervical sympathetic cord with resection of the cervical vagus branches that enter the chest and certain rami communicantes; section of the cervical sympathetic together with the superior cardiac nerves. When more than half a dozen operations have been devised for the relief of a condition, one may safely presume that wisdom demands a most cautious attitude of healthful and reasonable doubt regarding the precise value of any of them.

If surgical enthusiasm leads away from such a spirit of doubt, then one should at least contemplate and weigh the frank admissions of enthusiastic supporters of the operative relief of angina regarding operative mortality, postoperative complications and the percentage of permanent operative cures. In reports of Leriche,[2] of Brown and Coffey[3] and of Hofer[4] one encounters quite enough to make one cautious in reaching a final and dogmatic judgment on the operations for angina.

This caution is reenforced if one harkens to those authors who set about in various ways and from various angles to express critically destructive opinions regarding the surgery of angina pectoris. The late Sir James Mackenzie, in the last edition of "Diseases of the Heart," delivers a veritable diatribe against surgeons in general and surgeons in particular who perform the operation of sympathectomy for angina. Only a bold surgeon may wave aside such an opinion as totally unwarranted. No wise surgeon should attempt to cure angina without having read Sir James' conclusions at least once.

Daniélopolu[5] believes, in consequence of observations made on dogs and on patients that resection of the stellate ganglion is dangerous and induces grave disturbances of ventricular conductibility and degeneration of the myocardium. This author in his turn has devised an operative technique that is supposed not to damage the centrifugal fibers that run through the stellate ganglion. In another article, Daniélopolu says that removal of the stellate ganglion as an operation must be definitely abandoned. Leriche[2] cautions against both excision of the stellate ganglion and excision of any cervical ganglion. He shares Daniélopolu's fear of pulmonary edema after stellate ganglion excision and believes that removal of any of the other cervical ganglia may be followed by persistent troubles of a more or less compromising character.

The Czecho-Slovak Surgicogynaecologic Society[6] devoted a meeting to a particularly interesting discussion of the proposal of its president, Professor Kukula, to resect the sympathetic around the aorta and in the anterior mediastinum. Professor Kukula was himself a sufferer from angina of which he eventually died. He spent his last months studying angina. In his clinic, relief followed in 60 per cent to 70 per cent of cases of sympathectomy. Kukula himself, however, was unwilling to submit to operation on account of such undesirable complications as atony of the esophagus, with irregularities of deglutition, hemorrhagic pleural effusions and irritation of the third branch of the trigeminal nerve.

Brandsburg[7] performed unilateral or bilateral sympathectomy on 20 dogs and 12 rabbits and then examined the heart

muscle at period ranges from 1 to 100 days. He found that within the first few days after operation there was dilatation of the blood vessels with hyperemia, edema, intramuscular round cell infiltration and an initial stage of muscle striation, followed by its disappearance. These changes he interpreted as indicating a disturbance of muscle nutrition, causing parenchymatous degeneration. Up to the fourth postoperative month, the degenerative changes in the heart muscle became more pronounced.

Lewit[8] also was convinced that the heart muscle suffers as a result of sympathectomy. He admits the advisability of the operation if the heart muscle is comparatively sound but says that if this be not the case the operation has more against it than in its favor.

One must evaluate the worth of operative procedures for angina on the basis that they furnish freedom from pain or that they induce discomfort and danger due directly to postoperative complications. In other words one must determine whether they accomplish good or work harm or possibly do both harm and good to a measurable degree. To practice such judgment is difficult, because many patients with angina pectoris not subjected to operation experience spontaneous and lasting freedom from pain due most frequently to weakened heart muscle and lessened pressure. Other patients who have been operated upon do badly because of essential heart failure unrelated to the operation. The fact is that there has been very little work done from the purely clinical side that is of help to the thoughtful, conservative surgeon seeking to set for himself rational indications on which to rest his operative therapy for angina pectoris. One of the few and one of the best clinical studies has been made by Hermann Isakowitz[9] from the Third Medical Clinic of Berlin University.

Isakowitz points out the difficulties involved in a clinical study of patients whose hearts almost invariably show involvment of muscle or of vessels of supply. He realizes the impossibility of determining accurately whether postoperative symptoms are referable to progressive cardiac disease or to postoperative cardiac compromise. He is influenced very largely by the animal experimentation reported by Brandsburg (detailed above) and by earlier work done by Friedenthal[10] in 1902. Friedenthal showed that vagosympathectomy in the dog markedly compromised the animal insofar as heart function was concerned. Isakowitz studies instances of sympathectomy and stellate ganglionectomy by Lewit, sympathectomy by Hesse, depressor nerve resection by Guggenheimer and sympathectomy by Sachs. He comes to the conclusion that although a normal heart may tolerate very well the removal of a part of its extracardiac nervous mechanism, a compromised heart is crippled additionally by such procedures. He emphasizes the distressing dyspnea that comes on after operation and states that when dyspnea develops in a patient who previous to operation was free from this embarassment, the safe conclusion is that the heart function was compromised by the operation. He is not inclined to feel that we are in a position to draw warrantable conclusion from those patients who experience relief after operation because not enough time has elapsed in most instances; and he emphasizes the need of according proper respect to the moderately high operative mortality rate. In general, his stand is one of marked conservatism and his counsel is to regard operative therapy as a last resort to be applied only after most intensive clinical study of the patient and then only after carefully and persistently applied medical therapy, combined with psychotherapeutic efforts directed toward aiding the patient's morale.

And so we see that the problem is far from being a simple one. Cutler's admirable words of caution should be borne in mind: "It should be remembered by all who would shoulder the responsibility of operating on such patients that this study is still in its experimental stage and that only

those who are carefully studied and carefully selected before operation can be justifiably submitted to operation." I should add that such careful studies can be made only by a qualified internist and that no other surgical procedure calls for closer cooperation of internist and surgeon than does the operative attempt to palliate angina pectoris.

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[SURGICAL SUGGESTIONS]

MOBILIZING and rotating the duodenum not only facilitates removal of stones from the depth of the common bile duct but also provides a means of making sure that all are removed. Occasionally transduodenal or retroduodenal choledochotomy is necessary to dislodge a calculus from the ampulla of Vater.

PROLONGED tube drainage of the hepatic ducts to evacuate any bile sand, inspissated bile and bacteria that may be present and thus to reduce the tendency to further stone formation is the wise course to adopt in any case of hepatic duct calculi, whether or not there is evident infection.

SECONDARY SEX CHARACTERISTICS AND THE GONADS

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THE general concensus of opinion seems to be that the secondary sex characteristics, in both the lower animals and man, are dependent chiefly upon the integrity and type of their respective gonads.

This opinion apparently is based upon the fact that castration of immature animals prevents full development of the secondary features. That these characteristics are not necessarily dependent upon the gonads is shown by several facts. Belfield mentions two observations, in this respect, that are worthy of consideration, viz.:

1. The complete sex features of mind and body, including the external genitalia, have been found in persons congenitally devoid of gonads, as proved by post-mortem examination. (Montfaleon relates a case, reported by Cabral, of a soldier who was hanged for rape, who, on dissection, was found to be without testes in either the scrotum or abdomen.)

2. The sex features including the external genitals of one sex have been exhibited by persons congenitally devoid of gonads normal to that sex (Figs. 1 and 2).

The belief that sex emanates from the gonads is based on the idea that the two sex complexes are separate entities which are immutable and antagonistic. The biologic conception of sex, on the contrary, is that it is but a single entity with variable degrees of femininity. According to Benda "the primary anlage of the entire sexual system of the vertebrae must be regarded as female," whereas Belfield claims that, "the fertilized egg is a potential female whose deviation toward the male is essentially a failure of potential development."

Early in the development of a neutral body, specialized reproductive tissue, or germ-plasm, is distinctly different from that of the body tissue, or somatoplasm, from which the gonads develop. This germ plasm is apparently of two types, that characteristic of the male and that of the female. The association of these reproductive tissues with the somatoplasm establishes sex. However, sex characteristics do not necessarily depend upon the presence of active germ-plasm nor the type of reproductive tissue present. The thyroid, pituitary, adrenal, and other glands all play a definite rôle in sex characteristics and may cause a more definite change in these when diseased than even those caused by the gonads (Fig. 3). Cases have also been reported in which the secondary features of the male, including pronounced beard development, and even hypertrophy of the clitoris, have developed in young girls because of hypernephromatic development as well as with diseased thyroids, that are similar to those caused by a cystoma of the ovaries (Fig. 4). In 1849 Berthold demonstrated the fact that the testes have a dual function: the production of spermatozoa, and the elaboration of an internal secretion, both of which served a common purpose.

At the present time there is no definite evidence that the sex characteristics of the male are associated with spermatogenesis. On the contrary, there is considerable evidence indicating that these characteristics are due largely to the action of certain cells lying in the interstices of the seminiferous tubules known as interstitial cells, which were discovered by Leydig in 1850. Kölliker in 1854 demonstrated these cells, not only in the interstices of the tubules but also under the tunica albuginea.

According to Borim and Ancel, Chapin, Allen and Whitehead, the interstitial cells make their appearance in the fetus and functionate even before the spermatic cells are fully differentiated. If the secondary sex characteristics are entirely due to the function of these cells it is obvious that they would be absolutely essential to all forms of life, yet Pezard claims that they are not present in certain forms of life.

Fig. 1. Man, aged forty-seven years, with normal masculine sexuality; penis of typical structure, smaller than the average. (After Neugebauer.)

He has failed to demonstrate the presence of interstitial cells in adult Orpington fowls, as well as in golden pheasants, and says that they are absent even during their greatest sexual activity. Boring and Pearl, however, claim that the interstitial cells are demonstrable in male chicks just before being hatched but not in adults.

According to Felix, the interstitial cells develop in the human fetus in the second month of fetal life, and become quiescent at the fifth month, when their formation ceases until after puberty. These cells in some instances remain long after complete degeneration of the spermatic tissues. Therefore the disappearance of the spermatic tissue does not alter the normal progress of sex characteristics, whereas, he claims, degeneration of the interstitial cells causes a loss of libido and the change of sex characteristics as seen in eunuchoi-

Fig. 2. Internal sex organs of man pictured in Figure 1; ovaries, tubes, uterus and vagina emptying into posterior urethra (utricle); prostate gland; suprarenal cortices (not portrayed), about five times as large as normal; no testes. (After Neugebauer, who compiled reports of 13 men so constructed.)

dism and pseudohermaphrodism. In birds, mammals, and other animals there is a close relationship between sex maturity and the appearance of secondary sex characteristics, which are more manifest in the male as shown by the lion's mane, the horns of the stag, the variegated plumage of birds, the phosphorescent organs of the firefly and glowworm, and the distribution of hair in man. Whether or not the sex characteristics are determined by the sex glands depends upon the form of life considered. In insects they are not. (Oudeman, Mersenhiemer and Kellogg.) Removal of the sex glands from the gypsy moth, for instance, in no way alters its characteristics.

In certain animals the sex characteristics are cyclic and appear only during their sexual activity as seen in the antler growth of the stag, nest building by the male birds, and the peculiar saliva of the crocodile.

During the rutting season, stags are

highly nervous and always ready to fight for possession of the hinds, fish exhibit marked coloration, the lyre bird develops an elaborate tail. When the season of sexual excitement is over, the prongbuck loses his horns, stags will herd together, nest building ceases, the fish lose their coloration and the lyre bird the tail, all to be assumed again the next season.

In warm-blooded species, the heavy burden of reproduction imposed on the female is transitory, and cessation of ovulation is sometimes accompanied by a change of feminine to masculine features. In the woman a change of the distribution of fat, development of beard, change of voice, and other features characteristic of the male are often seen after the menopause. The change of plumage of the female toward that of the male and the development of spurs in old hens are familiar, but such change cannot be ascribed to testes since they do not exist in these birds. Similar changes may occur in young hens after castration. The mutation from the female toward the male characteristics has been observed in all periods from fetal life to old age. Darwin recorded cases of an old duck which assumed the plumage of a drake, as well as a castrated duck which assumed the characteristics of a drake, and of an old sterile deer which developed antlers. Goldschmidt contends that no animal, including the human, is purely male or female, that each has the potentialities of both. He thinks that sex intergrades are not degenerates, inasmuch as fifty per cent are found in normal families. He claims that they are the resultant of crossed matings in persons of different genetic constitutions, inasmuch as "contrary sexualis" is of greater ratio in these people than in those more sanguinely constituted. Forty years ago Pfluger found that of one hundred frogs caught in the spring, 84 per cent were females and only 16 per cent males, as determined by the gonads, whereas of 100 frogs in the fall, about 50 per cent were male and 50 per cent female. He found that in the newly transformed frogs the ovary constituted the greater part of the gonad: with time the ovary atrophied and the testicular portion developed in about half of them. In some of them transmuta-

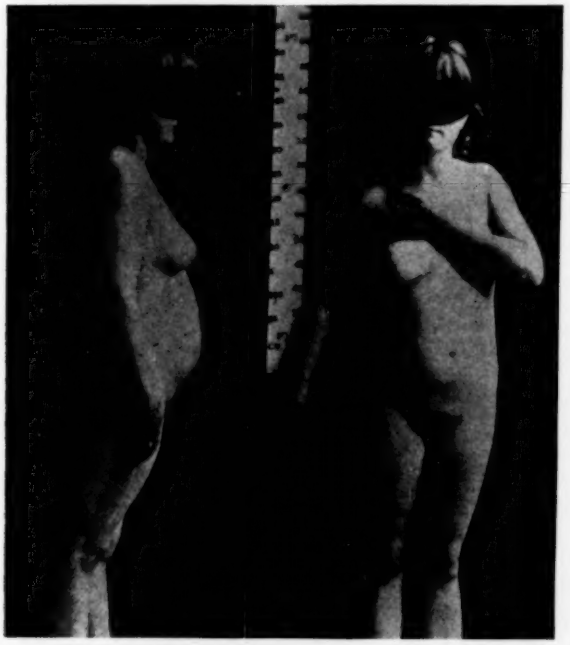

Fig. 3. Case of Dr. Gilbert Horrax. Reproduced by author's permission from *Arch. Int. Med.*, 1916, xvii, 629. Girl of eleven years, height 152 cm. (60 in., 114 lb.). At one year began to develop abnormally physically; menstruated regularly and showed other secondary characteristics just before eleven years. Supposed to be a case of pineal disease; roentgen ray showed enlargement of sella turcica.

Fig. 4. Normal menstruating girl at sixteen years; at right, same girl at nineteen, with full beard; no menstruation for two years; necropsy, multilocular cystoma of ovary. (From Alberti.)

tion was incomplete and the gonad became a composite ovo-testis.

Belfield says that tadpoles usually develop into male and female frogs in equal number, but that by feeding them tumors of the human suprarenal cortex they are transformed almost exclusively into male frogs. There are a number of cases on record of hens that carried on all the functions of a hen and later developed tuberculous, the infection having destroyed the ovary, which was replaced by a sperm-producing testis.

The intersexual or composite gonad-ovo-testis has been found in such female mammals as the mole, goat, pig, dog and woman (Fig. 6). Belfield says "such ovo-testes are probably not rare in the human subject. Three are reported by one observer, but have been until recently rarely looked for."

Fig. 5. Bird above shows comb and wattles of cock, tail and spurless legs of hen; bird in middle, transformed hen with one sperm-producing testis, and an atrophied ovary, with one corpus luteum; bird below, ovary, no testes. (From Boring and Pearl.)

all the characteristics of a cock, including plumage and the development of wattles and comb (Fig. 5). Crew reports an instance in which a chicken was an egg-laying hen until three and one-half years old, when in successive moltings, she was transformed into a cock, which fertilized a hen from whose eggs young chicks were raised. Post-mortem examination showed the transformed hen to be extensively

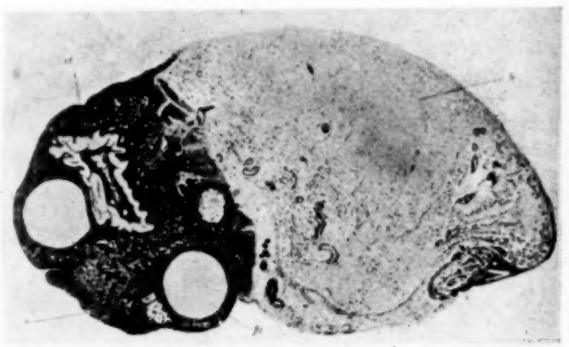

Fig. 6. Gonad of pregnant mole: At left, ovary with typical follicles and corpus lūteum; at right, spermatic tubules. (After Kohn.)

Steinach and Sand successfully grafted ovaries from female guinea pigs into previously castrated males and state that these "feminized males" developed characteristics peculiar to the female, such as hypertrophy of the mammary glands, female skeleton, and texture of hair. "Masculized females" also took on the somatic characteristics of the male.

The mutation of sexes is chiefly from the female to the male. This is well demonstrated in the observations made by Lillie on the free-martin, a female twin of the male calf, which develops sexually indifferent to cows and bulls alike and resembles an ox. In the free-martin, the internal reproductive organs are chiefly male whereas the external are female. Lillie's observations show the free-martin to be primarily a female, with ovaries, tubes, uterus, and vagina, which later becomes modified to the male type by means of a male sex hormone, thought to be from the secretion of the interstitial cells which circulate in the fetal circulation supplying both twins. If the circulation of both twins

is separate this does not take place, and in case of both twins being male they develop normally and are fertile.

Edmunds[5] reports a case of an apparent girl who manifested all characteristics of a girl until she was fourteen years of age when the testicles descended and revealed the true sex. Betts[2] reports a case of a man weighing 190 pounds, who had a scanty beard with feminine pubic hair, a hip measurement of 42 inches, and a large pendulous breast 8 inches in diameter, with a clitoris 1¼ inches long and 3 inches in circumference, with a rudimentary vagina, but no scrotum or vulva. On operation, a mass 8 pounds in weight was removed from the abdomen. It consisted of 8 small masses all of which, Betts claims, resembled ovaries. His amorous desires were toward females and he was said to have been happily married.

BISEXUALITY A NORMAL INHERITANCE

Bisexuality has been recognized as long as there has been an historical account of mankind. In fact, the Biblical account of creation not only records the dual nature of man but likewise that of his creator. In Genesis 1:26–27 we read, "God said let *Us* make man in *Our* own image after *Our* own likeness, and let *Them* have dominion over the fish of the sea, and over the fowl of the air and over the cattle, and over all the earth and over every creeping thing that creepeth upon the earth. So God created man in *His* own image, in the image of God created he him: *male* and *female* created he them," whereas in Genesis 5:2 we read, "male and female created he them, and blessed them and called *their* name Adam in the day when they were created," which, according to Scripture, was the sixth day of creation. Later, after Adam had named all the beasts of the field but was without "a helpmeet," God caused him to fall into a deep sleep, and, after removing one of his ribs, made woman. Adam, recognizing her, said, "this is now bone of my bone, flesh of my flesh; she shall be called woman because she was taken out of man." It is quite obvious that Adam was created a composite male-female as God "let *them* have dominion over the earth" and "called *their* name Adam." It was only after the feminine component of Adam was removed and became a distinct separate entity that she was known as woman. Pagan history and mythology frequently refer to the bisexuality of man. Even the Greek god of masculinity, Hercules, was also represented

Fig. 7. Hercules.

as being composite male and female (Fig. 7).

The old Hebrew idea of Urim and Thummim, male and female principles, clearly demonstrate their belief in bisexuality. Paul Carus relates in the Oracle of Yaheh that in Chinese documents written 5000 B.C. known as Yih King (Book of Changes), Fuh Hi, the mythological founder of Chinese civilization, carries a tablet in his hand on which are inscribed the symbols of Yang and Yin, the two sets of opposite contrasts, male and female, both of which are supposed to hold the secrets of the universe. The Chinese claim that "all things that exist are but a mixture of these two, and the conflict between these influences is responsible for all problems."

Freud[6] was one of the first investigators to give us a comprehensive idea of the bisexual nature of mankind but was inclined to consider it as physical hermaphroditism and abnormal, whereas recent writers are inclined to consider it a normal-

ity and primarily a part of each individual. Hence man and woman are not purely masculine and feminine but a variable mixture of both, the characteristics being largely determined by the sex element predominating. Physically these rudiments of sex organs of both sexes are in each person at birth. These atrophied remnants in the primitive body remain inactive and dormant until activated by some specific

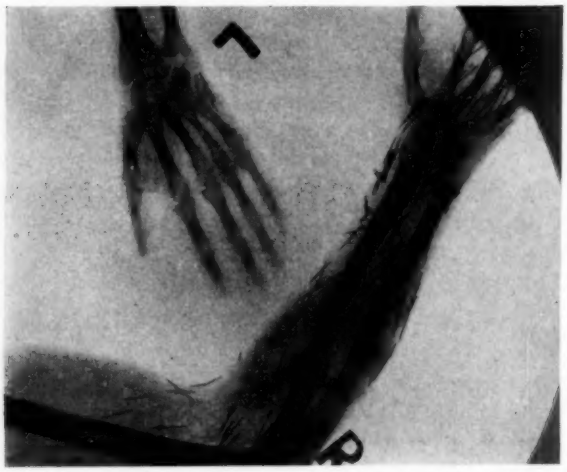

Fig. 8. Case of Dr. Wills, U. S. Veterans' Hospital 100.

stimulus, when the castrate may become feminine and the woman develop the male attributes frequently seen after the menopause. Berman[2] maintains that femininity and masculinity have a definite basis in the reaction of the internal secretions, but there is no absolute feminine or absolute masculine.

Fleiss, while studying the nasal mucous membrane of women, noted definite changes in the nose during menstruation, and furthermore was able to obtain relief of menstrual disturbances through treatment of the nose. He observed definite congestion and exfoliation in the nose in cycles of twenty-eight days, when there was an exhibition of the sex characteristics of the female. In males he found a similar sex cycle of twenty-three and a half days. In a series of female cases he observed, the sex cycle would come every twenty-three days, the female masculine phase, during which time the behavior was of a more masculine type, when she was more prone to commit crime, and it is claimed that pregnancy during this period is practically impossible. A series of male cases exhibited this phenomenon every twenty-eight days, when they were said to be in their feminine phase, and exhibited definite feminine characteristics. This may account in a measure at least for homosexuality. We had two male patients who had, without apparent cause, bloody discharges from the urethra every twenty-eight days. We also had a number of cases who regularly had conjunctivitis of one or the other eye which occurred about every four weeks, and for which no definite etiology was determined.

Dr. Martin related that while in Europe he came in contact with representatives of homosexual societies who were apparently proud of their bisexual characteristics. They claimed that it was just as normal to be a homosex as to have red hair. He says they had societies in all the large cities, with a membership of some 40,000 in Berlin alone, also that they had their own club rooms, restaurants, periodicals, and even a small island in the Black Sea wherefrom all women were excluded. Freud assumes that the sex instinct is sublimated or refined into many qualities but apparently he did not recognize the importance of the maternal instinct. In both sexes the sexual, aggressive or masculine, and the maternal, protective or feminine instincts co-exist. Males may exhibit great femininity or females great masculinity, but inasmuch as the sexual instinct is dominated by the sympathetic, and the maternal by the autonomic, it is evident that both cannot dominate at the same time. In the recognition of this fact, we may find the basis for the instabilities and sex perversions of homosexuality, and agree with Berman in that, "the functional hermaphrodite must satisfy two doubly flowing streams of visceral pressure within himself." Nevertheless it would be interesting to know the masochistic motives of a patient who obtains keen sexual pleasure by making himself a human pincushion (Fig. 8).

HERMAPHRODITISM

In considering the subject of hermaphroditism an embryological résumé may be advantageous at this time. As already stated, in fetal life the sexual apparatus in both sexes is indifferent, therefore neutral, and the germ-plasm designated for the sexual organisms is separate and distinct from that of the body tissue or somatoplasm. From this germplasm develop the sexual progenitors known as the indifferent genital gland, and the Wolffian and Muellerian ducts. The indifferent genital gland originates from the mesothelium of the body cavity and becomes part of the Wolffian body. The latter undergoes proliferation to form the genital ridge which gives rise to the ovaries and testes, from which the mesothelial cells form the "germinal epithelium of Waldeyer," and become the progenitor of the ova and spermatozoa of the future sex. The vas deferens and epididymis develop from the Wolffian duct; from the Muellerian duct, which develops shortly after the Wolffian duct, and which it parallels to the cloaca where both terminate, develop the uterus, Fallopian tubes, and vagina in the female, and uterus masculinus in the male. The fusion of both the Wolffian and Muellerian ducts form the urogenital sinus, from which develop the external genitalia of both sexes, any unusual or faulty development of which gives rise to hermaphroditism.

Hermaphroditism is common in both the vegetable and animal kingdom. Humanity begins its existence in the state of hermaphroditism. This condition is found until the end of the second month of the human embryo as well as in the lower animals. After the fourth day, in the chick, the genital gland begins to indicate whether it will be testicle or ovary. In the rabbit, the change takes place on the fifteenth day, and in the human embryo, on the thirtieth day. Hermaphroditism, however, does not occur until the external genitalia simulate one or the other sex.

According to Greek mythology, Hermaphroditus, the son of Venus and Mercury, was educated by the Naiades who dwelt on Mount Ida. At the age of fifteen, while resting in the cool shades on the woody banks of a fountain and spring near Caria, he was solicited by Salmacis, the nymph of the fountain. His refusal provoked her and caused her to pray to the gods to amalgamate poor Hermaphroditus to her body thereby making them one. Apparently she won the favor of the gods since her request was granted, although the distinct characteristics of each remained unchanged. Thus began the bisexual race of the Androgynes of the ancients.

Remondimo[8] claims that the early Franciscan missionaries to California found men of uncertain sex dressed like women. They were thought to be hermaphrodites and were used by the Indians chiefly for pederasty as a part of their dance ceremonies. Hammond also mentions this practice as being in vogue among the Indians of the Southwest. These men were previously eunuchized by persistent onanism. Debierre reports the case of Marie-Madeleine LeFort, whose head was masculine, with a full beard and masculine expression, her chest was covered with hair, yet her breasts were developed and her genitalia were feminine except that the clitoris was greatly hypertrophied. Her development was said to be "sexually that of a perfect woman and she menstruated regularly."

Burden[4] reports a case of a British soldier, aged forty, who served for five years in the British Army and who attended the Mayo Clinic and was examined for recurring attacks of hematuria. For ten years prior to examination he had spontaneous hematuria every four or five weeks accompanied by a distinct pain in the lower abdomen. Physically he was of feminine build, with a light beard and masculine voice, normal penis and scrotum but without testes in the scrotum. The pubic distribution of hair was feminine (Fig. 9). Rectal examination failed to reveal the presence of a prostate or seminal vesicles. In his sex sentiments he preferred male society. A diagnosis of vicarious hematuria with

developmental anomaly of the genito-urinary tract, and solitary left kidney, was made. Exploratory laparotomy was advised. An operation was performed at which time the following structures were removed: uterus, tubes, ovaries, testes, epididymis and appendix (Fig. 10). Spermatozoa were demonstrated in the testicular tissue. The patient made an uneventful recovery. Burden states that "this is an

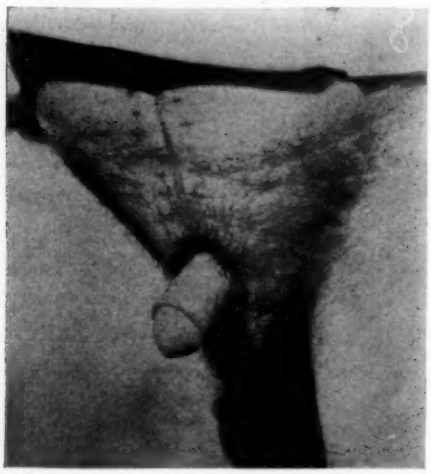

Fig. 9. Pubic region showing normal development of penis and feminine distribution of pubic hair.

instance of the hermaphrodism of bilateral type, as evidenced by the presence of ovaries and testes of both sides. There is also proof of functional activity of the two different genital glands."

A very unusual case of hermaphrodism was that of Hohman of Vienna, who died at the age of forty, and was reported by Rokitansky. Autopsy revealed two ovaries and tubes, a rudimentary uterus and one testicle. His penis was hypospadic and the scrotum bifid. Both ovulation and spermatogenesis were demonstrated. It is claimed that he copulated with both male and female. Of equal interest was a hermaphroditic soldier of the Hungarian Army who was reported by Montaigne as having been confined of a well-developed infant while in camp. He also reported a monk who was brought to successful accouchement in a convent cell, whereas Duval reports a similar case of a priest in Paris who was found pregnant, and, as a consequence, was imprisoned in the ecclesiastical court prison. There was no definite information in either case as to the possibility of autopregnancy.

One of the most interesting cases of hermaphrodism recorded is reported by J. Allen Gilbert.[7] A medical student who went through school as a girl was of a decided dual nature but preferred the masculine. Her sexual nature was both

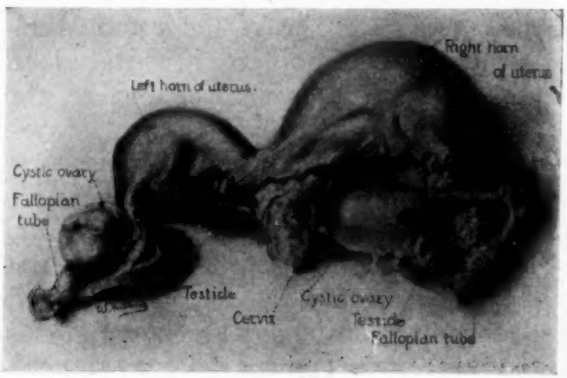

Fig. 10. Structures removed at operation.

male and female and copulation with each was not only possible but also indulged in. She had both male and female sex organs and was pregnant as a woman. Later, at her own suggestion because she wanted to be a male, a hysterectomy was performed. She graduated as a man and married a woman by whom she had three children, all of whom are living. At present she has an active practice, as a man, in a certain western city. Incidentally she was a schoolmate of a colleague of mine who knows her history intimately and who vouches for the verification thereof.

The *Illinois Medical Journal*, February, 1924, page 90, gives an interesting account of an unusual case of a "Man Pregnant with Twins."

Hermaphrodism in the human being can be readily understood when we consider the presence in the human fetus of both the Wolffian body and the Mullerian duct, which fact alone attests to a normal primitive condition of hermaphrodism. According to Bell,[1] "it appears that the determining causes of sex originally pre-

dominate in the direction of the defined nature of the gonads, but that masculinity-producing factors arise at a later period, possibly in the last weeks of pregnancy or soon after birth—and counteract the original femininity-producing influences. Moreover, since we know that every person is bisexual, however masculine or feminine in characteristics, it is probable that in cases such as these, forces producing masculinity are so overwhelming that not only is femininity suppressed and masculinity produced, but even precocious masculinity."

Emasculation and the Sex Characteristics

In the consideration of bisexuality the subject of castration may be apropos. We know that in the case of man double castration before puberty produces feminine characteristics, and the penis remains juvenile. The individual becomes a sterile, impotent eunuch, chiefly feminine in habitus. On the contrary, removal of both testicles from the adult results in immediate sterility, but potency, libido, and the male habitus may persist either for a variable time or permanently.

The Italians allowed their children to be eunuchized for singers in cathedral choirs, as well as to grow up to take female parts in comedies, their voices simulating that of the other sex. On the same principle, the basso-profundos were infibulated that they might retain their bass.

Castration of a young bull will not prevent the growth of the horns, which may even grow longer than in the case of the cow. On the other hand castration of the boar prevents the tusks from developing. In the eland and reindeer, of which both sexes have well-developed antlers, castration does not affect the horns. On the other hand castration of a young male deer, before the antlers begin to develop, prevents their development, whereas if castration takes place in the adult deer after the antlers have fully developed, it results in their precocious shedding. Castration of the ram of Herdwick sheep causes a cessation in the growth of the horns, but spaying of the female does not result in horn development.

According to Potts, Smith and others, certain male crabs which become parasitized by other crustacea develop female characteristics, but removal of the ovaries of the female crabs does not produce any change. Female fowls and golden pheasants assume in old age the characteristics of the male, as is also the case when female chicks and ducks are spayed. Castration of the Seabright cock causes its female plumage to become like that of the ordinary male, but the plumage of the ordinary rooster is not altered by castration, although the spurs, combs and wattles are not well developed.

Eunuchs have always been considered an essential part of the social life of Oriental countries, hence demand for them has been correspondingly great. Eunuchism may be congenital, or due to accident or design. The classical eunuch is either produced by surgery, usually crude, or the genitalia accidentally removed when young. It is achieved by such practices as using animals to bite off the scrotum and contents, repeated ligation of scrotum, repeated slight trauma of the testicles several times daily, crushing, repeated compressing of testes, and their excessive function to break down the normal testicular substance.

The old pagan priests prepared themselves for a life of chastity and celibacy by soaking the scrotum in hot water followed by frequent repeated compressions, thereby causing the testicle gradually to disappear.

In order to be valuable guards for the Turkish harem, as well as trusted eunuchs for the aristocratic oriental households, complete abolition of the genitalia was required. In most cases this was produced by the taille à fleur de vente method, or entire removal of the external genitals by a quick stroke of a razor. Bison states that the mortality by this method was about 90

per cent. The Soudan alone furnished over 3800 eunuchs annually, the material for which was obtained from Abyssinia and neighboring countries, where they were gathered by war, kidnapping parties, and by purchase. The great eunuch factory of that country was a large monastery located on Mount Ghebel-Eter at Abu-Girgeh where the unfortunate African children were gathered and either simply castrated or had complete abolition of the parts, depending upon the type of eunuch demanded. Inasmuch as there was no attempt to stop the hemorrhage, with the exception of a little styptic powder, the mortality was said to be 9 out of 10. The Coptic monks did a thriving business and furnished Constantinople, Arabia, and Asia Minor with many of the much sought for eunuchs. Remondimo says, "It is estimated that 35,000 little Africans are annually sacrificed to produce the Soudanese average quota of its 3,800 eunuchs."

In Mexico descendants of the Aztecs, the Mujerados, were developed for religious purposes. Men between the ages of twenty and thirty-five years were selected and subjected to repeated masturbation several times daily, and compelled to ride horseback, thereby keeping the genitals in a state of constant irritability, thus causing a gradual atrophy of the testes and penis, and the disappearance of pubic hair. Suckling babes were also used to produce marked hypertrophy of the breasts.

Throughout the ages religious fervor and the idea that to be "carnally minded is death" has promulgated the idea that since the sex organs were the basis of carnal-mindedness, entry into the celestial realms meant their subjugation or removal; therefore both the clergy and their devotees resorted to emasculation in order to be fitted for the heavenly kingdom. The Skoptsi of Russia and Lipovans of Rumania, interpreting Matthew 19:12, "For there are some eunuchs, which were so born from their mother's womb and there are some eunuchs which were made eunuchs of men, and there be eunuchs which have made themselves eunuchs for the kingdom of heaven's sake. He that is able to receive it let him receive it," as a direct commandment for heavenly bliss, emasculated themselves. This sect or cult was started by an ignorant Russian peasant by the name of Andrei Ivanov but got its greatest impetus through the efforts of his assistant Selivanov, a religious fanatic, who was apparently a paraonoiac who proclaimed himself "the Son of God incarnate in Peter the Third," and claimed the title of "God of Gods and King of Kings." Strange to say, although incarcerated in an asylum from which he escaped, he soon had thousands of followers, many of whom were from the noble and aristocratic families of Russia. The Skoptsis are millenians and claim that the world will come to an end just as soon as their number reaches the 144,000 mentioned in Revelation 14:1.

Inasmuch as their religion permits them to have one or two children before mutilating themselves, it would be interesting to get their interpretation of the fourth verse, i.e. "These are they which are not defiled with women for they are virgins," etc., and the application thereof in respect to their religion.

In Smith's Dictionary of Greek and Roman Biographies and Mythology, it is related that Uranos, the progenitor of all the gods, and the first king of Atlantis, was a eunuch. It seems that when Uranos imprisoned his second progeny, the Cyclops, in Tartarus because of their great strength, his wife Gaa became angry and incited her next-born children, the Titans, to rebel against their father. It is related that Saturnus, the youngest son, made a sickle of a diamond and successfully emasculated his father Uranos, thereby deposing him. This made the sea angry so that great commotion took place when the members fell into this element: but it is said that contact of the genitals with the foam miraculously produced Venus, which apparently appeased its anger.

Castration has practically always been a means of punishment for criminals in both oriental and occidental countries. Among certain tribes castration of prisoners of war was commonly resorted to with much the same significance of victory as scalping was with the Indians. At the same time it was a mark of servitude and reduced the prisoner to slavery. The Caribbeans made eunuchs of their prisoners of war on the same principle that caponizing is done today. They found them easier to fatten and more tender when cooked. When the British first found the Hottentots, it was customary with the males to remove one testicle, supposedly for the purpose of enabling them to run more swiftly, but they also had the idea that twins came from two testicles, hence in order to avoid having more than one child at a time one testicle was sacrificed. In case of mixed twins, the female child was smothered, but if there were two boys or two girls, the weaker one was destroyed.

Wheelon[9] and others have made some interesting observations on the effect of castration on prostatic development. In case of white rats, they found that castration not only inhibits development of the prostate but leads to involution of the fully developed gland. Normally in old age, in man, the prostate undergoes atrophy but in a large per cent of cases hypertrophy instead takes place. This, according to Wheelon, is due to an overproduction of the testicular hormone in combination with reduced spermatogenesis. Harrison and White perform and advocate castration as a curative means for prostatic hypertrophy. On the other hand, Remete claims that only normal prostates atrophy as a result of castration, whereas little benefit can be expected from this method in the more hypertrophic types.

CONCLUSIONS

Summarization of the more recent observations proves that the secondary sex characteristics do not necessarily depend upon the secretion of the interstitial cells of the gonads, inasmuch as it has been shown by Pezard and others, that certain forms of animal life with most elaborate secondary characteristics, as for example the golden pheasant, do not possess interstitial cells in their gonads. Until forty years ago the contrary was thought to be the case, but now we know that the sex characteristics are more dependent upon the integrity and normal function of certain of the endocrine glands, and without at least a functioning thyroid, these features are impossible.

We know that the complete sex characters of the male or female have been observed in persons congenitally devoid of gonads, or having gonads of the opposite sex, and frequently observations have shown that the sex characters of the female can be replaced through natural causes by those of the male, even to the replacement of the ovary by a testis. Moreover certain pathological conditions, such as a hypernephroma, will cause arrested ovulation in young girls, and produce atrophy of the ovaries with hypertrophy of the clitoris, as well as changes in somatic development even to the development of a full beard. These and other facts lead us to agree with Belfield that "it is demonstrated that the gonad does not originate sex; that it is less essential to the maintenance of sex than is the thyroid or the suprarenal; and that it is indeed one of a chain of interesting endocrine glands, efficiency in every link of which is essential to normal function, sexual or somatic."

It is evident that some force independent of the gonads enters into the determination of sex which is associated with the chromatin formation in the fertilized egg. It is well known that various types of animal life have definite chromatic factors known as determiners. For instance every cell of the male housefly can be differentiated from the female cells by the number of chromosomes present. Inasmuch as the fertilized egg is the primary structure in which somatic life begins it seems logical to conclude that the fertilized egg not

only produces the sex gonads but likewise the sex characters. Moreover, inasmuch as during the stage of maturation a blending of equal ratio of male and female chromosomes is essential for the development of the egg structure, the feasibility of bisexuality can be readily seen. Although at first the germ plasm is neutral, it is said to be potentially feminine, but may become masculine by certain factors that predominate during its development. However, at no time is there absolute femininity or absolute masculinity, there being a variable admixture of both male and female sex features in both sexes. A faulty, or cessation of, embryonical development may result in hermaphrodism; hence, not only is each individual potentially feminine but primarily hermaphroditic.

It is well known that changes in these characteristics can be caused by either pathological processes or castration, as seen in the case of the former in the menopause, or in the latter by the failure of antler growth in deer, and that of the tusks in boars, or in the maintenance of the juvenile voice and feminine characteristics of the Italian singer, or choir boy, when castration is performed before maturity, whereas if done in adult life no apparent changes are manifest. On the other hand, in some forms of life, like the gypsy moth, there is no change whatsoever through removal of the gonads. Whether or not the change in sex features through castration is due directly to the loss of the gonads and their internal secretion prompts the query: Are not such changes largely due to changes and imbalance of the endocrine system resulting because of it?

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PATHOLOGY AND TREATMENT OF GASTRIC AND DUODENAL ULCER*

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PHILADELPHIA

IN his Introduction to the Study of Experimental Medicine[1] Claude Bernard says: "Medicine in its advance through the centuries has always been driven into action, and from numberless ventures into the realm of empiricism, has gained useful information;" that is to say, the medical profession has always been confronted with urgent problems, differing in detail perhaps at different times, but fundamentally the same. The thinking members of the profession recognize this and are disturbed constantly by the thought that they must have more knowledge before they can rationally treat their patients, but since patients present themselves with demands for relief, they are "driven into action" and must do the best they can. How true this is of peptic ulcer! Patients suffer from this disease, they ask relief, and it is only fair that we attempt to give it to them, even though we know so little about the disease itself. I say this latter advisedly as anyone with some experience and a study of the literature must know. Practically nothing is proved except that peptic ulcers exist.

There is even some doubt as to whether they are inflammatory, as evidenced by statements in recent literature to the effect that "probably most authors agree that they are inflammatory." It need scarcely be pointed out that inflammation, pathologically speaking, is participation of vessels and exudation, and this certainly appears in most ulcers. From time to time we ourselves have been guilty of publishing descriptions of the pathology, and have commented on the etiology of ulcers upon a number of occasions. We divide them, as do others, into the acute, the chronic with exacerbations, and the chronic varieties, stating that probably all chronic ulcers begin as acute ulcers, and that all of them at some time or another have acute exacerbations. General descriptions of the criteria on which this classification is based have been given a number of times; they are participation by vessels, as hyperemia, exudation, necrosis of layers extending to variable depths as far as and through the serosa, the formation of granulation tissue, localized acute and chronic peritonitis, adhesions, regeneration of mucosa, and to a less extent, other layers, and various special processes to be described below.

The microscopic findings in fresh ulcers are disappointingly negative; except for a very small amount of round-cell infiltration on the edges there is merely the defect. Even the round-cell infiltration may be lacking, and many acute ulcers appear as though they were artifacts, as though a portion of the stomach wall were punched out to a varying depth, even to perforation, by some sharp instrument. The older the ulcer, the greater the secondary reactive changes of progression and healing by granulation. Young and old connective tissue around the ulcer extends to a greater or less distance from the defect. Macroscopically, acute ulcers without reaction around them are funnel shaped, extending in an oblique direction terraced through the stomach wall. The defect is less in the muscularis than in the mucosa and least in the serosa; but this appearance is lost, the older the ulcer and the more reaction around it. According to some authorities, the funnel-shaped, terraced appearance is due to the arrangement of vessels, but

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according to others it is caused by the action of muscular tension and rubbing as the food passes through the stomach. The base of the ulcer, if acute, is quite clean, but in older ulcers it is likely to be dirty and covered with a layer of necrotic material under which is an edematous, glassy tissue which microscopically is edematous granulation. The absolute depth of the ulcer depends to some extent on the presence or absence of hypertrophic gastritis. If this is present, the mucosa is thcker, and hence the ulcer, if it extends through to the muscularis, is deeper. The edges of the defect may be covered with fibrin, or they may be hemorrhagic, swollen, edematous and spotted; necrosis indicates progression of the ulcer.

The sites of predilection in the posterior wall, along the lesser curvature and in the pyloric region, have given rise to the opinion that these parts of the stomach are poorer in vessels, or that the vessels are particularly tender, and that the musculature, being particularly powerful, compresses the vessels as it contracts.

Primary or acute perforation is said to occur when one of the acute varieties penetrates immediately and directly through the coats without much ado. More marked contractions or overfilling of the organ may complete a tear in the serosa when an ulcer has extended to that membrane. Such perforative openings are usually small and typically rounded or oval, with sharp edges, looking as though a piece had been punched out with a sharp instrument. Secondary perforation is said to occur when an ulcer is old and chronic and when acute exacerbations have led to more and more destruction of tissue until finally perforation takes place. In this case, however, there are likely to be adhesions to the neighboring parts and so the immediate danger of general peritonitis is avoided, with the exception of ulcers in the anterior wall of the stomach where adhesions are not so likely to occur and in which generalized peritonitis is the usual result. Such organs as the liver (left lobe), the spleen, pancreas, etc., stop the spread of material from a perforated ulcer, and encapsulated abscesses may occur in these neighborhoods. Very frequently the pancreas is found in the base of a chronic ulcer on the posterior wall. Curiously enough, the pancreas seems to be quite resistant to the digestive action of pepsin, but the surface of the pancreas at the base of the ulcer is covered with a plastic exudate, and the granular, nodular, yellow pancreatic islands are separated by cicatricial bands. This is easily mistaken for carcinoma. Rarer perforations are those through the diaphragm, into the gall bladder, externally through the abdominal wall, into the intestine, into the duodenum or into the colon.

A curious circumstance occurred recently in the Lankenau Hospital. On May 5, a man presented himself to the roentgen-ray department for study because of stomach trouble of several years' duration. His history was not typical of ulcer. On the morning of his arrival he endured a mild pain. He had taken a cathartic the night before, and had eaten no breakfast in preparation for roentgen-ray study. He was already in the fluoroscopic room and had a glass of barium in his hand about to swallow it, when he was seized with very severe pain in the upper abdomen. He placed the barium to one side and sank into a chair. The pain grew worse. He became very sick and about one hour later was operated upon and a perforated ulcer was found on the posterior wall of the first portion of the duodenum. Had he taken the glass of barium, it is probable the heavy weight of the drug would have been blamed for the perforation. It was lucky that he had been prepared, so to speak, for operation, and that his perforation took place at a time where no delay was experienced in rendering the prompt surgical measures that were necessary and that the barium had not emptied into his peritoneal cavity through the perforation. He is recovering without complications.

Hemorrhages in gastric ulcer may be small and repeated or large and repeated or small and single or large and profuse, but they are rarely fatal.

On April 14, 1927, a girl, twenty years old, came to the Medical Ward of the Lankenau

Hospital for treatment for several attacks of hematemesis. On admission the presenting symptom was mild pain in the chest, below the breast, and mild indigestion which, however, was not particularly significant. The blood count was r.b.c. 5,000,000; w.b.c. 15,000; hemoglobin 95 per cent. On April 22, hemoglobin fell to 70 per cent; r.b.c. to 3,400,000, and w.b.c. to 12,000. The following day she vomited a large amount of bright red blood, and digested blood was found in the stools. The red blood cells fell to 2,000,000. The patient was transfused three times with some improvement in the blood picture but none otherwise. On April 27 it was agreed in consultation with the medical staff that operation alone could save the patient's life. A huge, cratered, calloused ulcer was found in the first part of the duodenum, on the posterolateral internal wall. The ulcer was oversewn and a posterior gastroenterostomy performed. The patient died the following day.

In contrast to this, at about the same time, we had 3 similar cases, in which operation was done early and the outcome was favorable. While small hemorrhages are very frequent in the course of chronic ulcer, larger hemorrhages occur chiefly from erosion of larger arteries in the base of an ulcer, in the stomach wall itself, or even in a neighboring organ. Sometimes the ulcer is very small. Quite often the actual vessel cannot be found when the specimen is removed, unless injections are resorted to. Sometimes the conditions for rupture are prepared by a profuse round-cell infiltration disturbing the nutrition of the tissue so badly that necrosis occurs followed by hemorrhage. We have seen rupture of a small aneurysmal dilatation. If a branch of the coronary artery is opened, there is bleeding from both sides, since all of the arteries of the stomach anastomose.

As far as healing is concerned, it has been our experience, fortunately or unfortunately, that of all the operative specimens we have encountered, not one has been completely healed. Of course, many of the patients were operated on for acute symptoms when healing of the ulcer was not to be expected. But in many instances operation was done in one of the intervals of attacks of pain so well known to the clinician. Also a certain number of ulcers were discovered when the diagnosis was something else, and a certain number of retractions or scars or other evidences on the serous coat of the stomach or duodenum were encountered and excised. Among the latter, we would expect to find healed ulcers, but this has not been our experience. We have always found a defect, sometimes small, sometimes large, but plainly demonstrable. We believe that complete healing can take place, but our experience has been that healing is incomplete, i.e., the ulcer heals to a certain limit but not quite completely, and then breaks down again. Study of some of the autopsy material of the hospital (500 cases) has failed to demonstrate the number of ulcers and healed scars in the duodenum and stomach reported by other observers.[2] This is possibly fortuitous, but we enjoy basing our opinions on what material we have. Most authors agree that if an ulcer has once penetrated the muscularis, perfect healing cannot take place and a scar necessarily results. Others believe that mere destruction of the muscularis mucosae precludes healing *ad integram*. However this may be, we cannot help feeling that certain ulcers must heal completely and leave no trace.[3]

We believe it hazardous to draw conclusions as to the incidence of ulcer or the presence of a previous ulcer, from finding a scar in the stomach or duodenal wall, and even more hazardous to draw the conclusion that no ulcer was present because no scars are found. It is in just those scars described in the literature as being pulled in, that we have always found a defect. Any scars sufficient to change the shape of the stomach into the hour-glass type, or a stenosed, dilated, shortened lesser curvature, saccular or diverticulum-like ectasia have been found to be incompletely healed ulcers; in fact most of them were active.

As to carcinoma and ulcer, it may be said that the exact number of ulcers that become carcinomatous, and the exact number of carcinomas that were previous ulcers cannot be determined. Since reparative processes are occurring all the time in ulcers, we are faced with the problem of deciding between regeneration and tumor formation, which is an age-old problem. As we have stated a number of times, it is impossible to tell what would have happened had the surgeon not removed the piece of tissue. Ideally, we might diagnose beginning carcinoma in an ulcer when one portion of the circumference shows unquestioned malignant change and the other portions do not. But when carcinoma is present all around the circumference and extending into the surrounding tissue, it is impossible to say that it was not an ulcerating carcinoma from the beginning. We have been fortunate enough to obtain several specimens showing early carcinoma in one part of the circumference of a gastric ulcer. One of these cases was illustrated in a previous article.[4] Again, as we have already stated, the history may be of some help, making due allowance for the difficulties of diagnosis. If a patient has had typical symptoms of peptic ulcer for years and then has an exacerbation of symptoms which refuse to yield to treatment, and if he is then operated on and an ulcerating carcinoma is found, it is possible that the patient had an ulcer which became carcinomatous. But judgment on this point is precarious. From the practical point of view we do not see any reason for absolute percentages at the present time in view of the difficulties of decision. It is sufficient to know that a certain number of ulcers become carcinomatous and on this point there are only a few dissenting voices. In previous communications, we have attempted by history and pathological findings to say that the incidence of carcinoma in ulcers was 30 to 35 per cent. This is probably too high; nevertheless, the case previously referred to and several since have convinced us beyond doubt that the change does occur, and to our minds this is sufficient to render it desirable to remove ulcers surgically that fail to show a proper tendency to yield to other treatment within a reasonable time.

Thus far, we have said nothing of the etiology. We now assert with confidence that the etiology is not uniform but is varied. As the years pass, we feel strengthened in our position that the most useful way to regard peptic ulcer is to look upon it as a "secondary" disease. We thus do not focus our attention entirely on the stomach but pay attention to other parts of the body. Infection as a cause is championed by many authors. We feel that they are correct in many cases but we add the remark that there is no specific organism of peptic ulcer and that the finding of streptococci, staphylococci, colon bacilli, thrush organisms, etc., is not sufficient to identify them as the cause. They may be secondary invaders.

The hydrochloric acid and pepsin of the gastric juice are important factors, if not in the formation of ulcers, at least in their progress and their refusal to heal. Indirect evidence of this is seen, in addition to other facts, in the presence of islands of gastric mucosa in a Meckel's diverticulum and in which a typical ulcer is present.

The etiologic rôle of the nervous system and sympathicotonia is far from settled, although without doubt they are very important.

Factors such as mechanical sagging of the stomach, spasticity, arteriosclerosis, etc., are certainly among the etiological agents. The irritation or rubbing of food passing through the stomach is probably also a factor; for example, calves with a "rennet" stomach develop ulcers if fed coarse food before the rest of the stomach is developed. Recently Shapiro and Ivy[5] have presented some interesting work in which this mechanical rubbing of food is said to play a part. Rubbing of foreign proteins into the mucosa produces an

hypersensitivity and the rubbing in of the same proteins some time later in the same area, leads to a local anaphylactic phenomenon which causes tissue destruction and the presence of an ulcer. This fact brings ulcer in relation to immunity, i.e., to the problems of local immunity which are attracting attention in other fields at the present time.

To sum up our opinion of peptic ulcer at the present time: we believe it is a secondary disease, that infection is the most important etiological factor, that the gastric juice is important in maintaining chronicity, and that in any given case all sorts of causes should be sought for and eliminated in the medical treatment of duodenal and gastric ulcer and in the postoperative treatment when the ulcer has been removed.

Let us now turn our attention to the treatment of peptic ulcer. The answer to the natural question, shall it be medical or surgical, depends to some extent, at least, on the questioner. Both methods have their advocates and both claim a certain percentage of cures. Aside from my [Deaver's] prejudice, if you wish to call it that, in favor of surgery, there are certain indisputable facts that should have great weight in considering this aspect of our subject.

Enough has been said about the potential malignancy of gastric ulcer to establish the necessity of surgery for this form of peptic ulcer. Duodenal ulcer, on the other hand, as is well known, presents the possibility of hemorrhage or perforation.

The incident cited in the earlier part of this paper sufficiently illustrates the dangers of bleeding ulcer, and at the same time shows how insidious these apparently symptomless cases are. It has been estimated that bleeding occurs in from 50 to 80 per cent of all ulcer cases and that it proves fatal in from 3 to 11 per cent.

Perforation, on the other hand, occurs in about from 9 to 14 per cent of duodenal ulcers and the mortality depends on the time elapsing between operation and the first symptoms of perforation. Eleven per cent is the approximate average in our experience. The mortality in the interval operation for chronic ulcer is only about four per cent.

With these facts in mind, one must come to the conclusion that whatever its advantages, medical treatment may often prove merely temporizing, to say the least. A good working rule is that the ulcer patient who fails to show decided improvement after one or two series of medical treatments should be confronted with the advisability of surgery.

The type of surgery will, of course, depend on the personal preferences of the surgeon, and on the presenting conditions. While gastrojejunostomy plays a prominent rôle as a surgical procedure it is not the only one at the disposal of the surgeon. According to the exigencies of the case, such as size and location of a duodenal ulcer and other concomitant conditions, he may merely excise the ulcer, or do a pylorectomy or a pyloroplasty or even a subtotal gastrectomy. Indeed, wide resection is at present being strongly advocated, especially among European surgeons. It may have something in its favor, but until sufficient data are at hand to prove that the more radical operation reduces the incidence or obviates the development of marginal ulcer, the most serious sequel of gastrojejunostomy, there seems no very valid reason *per se* for extensive gastric resection for duodenal ulcer. The treatment of gastric ulcer, however, is a different matter. Here radical operation is the indicated procedure, principally because of the possibility of carcinomatous changes inherent in a certain percentage of such ulcers.

Excision of a small duodenal ulcer is the simplest, and would be the ideal operation if it positively insured the patient against future ulcers, and if it were not for extensive and troublesome adhesions which may form after the operation. For these reasons it is often advisable to supplement excision by a posterior gastro-

jejunostomy. The small duodenal ulcer on the anterior or anterolateral wall can be treated by excision with a cataract knife or by perforation with the cautery (Balfour operation) and closure of the perforation, followed by posterior gastrojejunostomy. For a large ulcer on the anterior or anterolateral or posterolateral wall of the duodenum, or a large or small ulcer on the posterior wall, gastrojejunostomy alone may suffice in some cases; others, especially ulcer of the bleeding type, require excision of the ulcer, if possible, or a pylorectomy including amputation of the duodenum and gastrojejunostomy. The results of these methods, however, are sometimes minimized by the fact that operations at the pylorus either do not always effectively reduce gastric acidity, or if reduced, the reduction, the great desideratum of the operation, is not maintained. Posterior gastrojejunostomy alone is indicated when the ulcer is located low down on the duodenum close to the head of the pancreas, as well as for ulcer obstructing the pylorus or the terminal duodenum. The latter, fortunaately, is rare.

Gastric ulcer is not only a more serious condition than duodenal ulcer, but also, as already indicated, is generally not amenable to the more simple operations. When, however, a small ulcer is found on the posterior wall of the stomach, excision through an anterior gastrostomy may suffice. The so-called saddleback ulcer, whether or not associated with hourglass deformity of the stomach, will require sleeve-resection, while a larger ulcer with extensive induration demands the more radical operation of subtotal gastrectomy. A valid reason, probably the most valid reason for the procedure, is the potential malignancy of gastric ulcer, no matter whether it is low or high, and since it is not possible to determine, except by microscopic examination, whether or not a given ulcer is malignant, nor which ulcers will and which will not undergo carcinomatous change, the safest method is wide resection both as a curative and as a prophylactic measure. Sleeve-resection combined or not with a posterior gastroenterostomy is not a popular operation with many surgeons, but in our experience it has given most satisfactory immediate and remote results in selected cases.

A subtotal gastrectomy may be completed by bringing a short loop of jejunum through an opening in the transverse mesocolon and making an end-to-side anastomosis with the cut end of the stomach, or a long loop may be brought over the great omentum and transverse colon and joined to the end of the stomach; in this procedure an enteroanastomosis should always be made at the bottom of the two loops to prevent the development of a vicious circle. The first is known as the Polyá, and the second as Balfour's modification of Polyá's operation. The advantage of the long-loop operation is that in the event of marginal ulcer necessitating a subsequent operation, the surgeon will have a larger section of bowel at his disposal for making a new anastomosis. A subtotal gastrectomy may also be completed by closing the proximal end of the stomach and making a posterior gastroenterostomy (Billroth II); or, when conditions permit, a direct anastomosis may be made between the cut ends of the stomach and duodenum (Billroth I). Sometimes I [Deaver] have obtained very satisfactory results from the Moynihan anterior short-loop gastroenterostomy, in which the open end of the stomach is anastomosed to the side of the jejunum not far distal to its origin.

Having dwelt on some of the disadvantages of medical therapeusis, it is only fair to call attention to the complications that may follow surgery. The most unpleasant and disheartening of these is, of course, marginal ulcer, which as we all know has the same inherent possibilities of hemorrhage and perforation as pertain to the primary condition. The incidence of marginal ulcer varies from 1 to 3 per cent. The cause may be faulty technique, or it may

be due to ulcer diathesis, that is, the persistence of hydrochloric acid. But whatever its cause, its incidence helps to keep the surgeon humble. The treatment of marginal ulcer is eminently surgical. The best procedure, is to undo the anastomosis and to perform a gastric resection, either a sleeve operation or a subtotal gastrectomy.

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[SURGICAL SUGGESTIONS]

IN a case of hepatic duct lithiasis and especially in the occasional case of stone formation in all the ducts, it is wise not to remove the gall bladder, even though it contains stones—unless it is too diseased to leave in place. Such a patient, usually female, is a "stone former" and there is no assurance that she will not again produce calculi in her bile-ducts. As a result of these, or of operations for their removal, her common duct may become so seriously damaged that the gall bladder may be needed to establish bile passage into the duodenum by anastomosis therewith or with the stomach.

AFTER cholecystectomy a very small tube drain is all that is needed to provide for possible escape of bile from the ligated cystic duct. It is a good device to stitch the tube with fine plain catgut to the duct stump, distad to the ligature, to prevent the tube from being displaced while the abdominal wall is being closed.

THE DUODENOGRAM APPLIED TO THE DEMONSTRATION OF A DUODENO-JEJUNAL DIVERTICULUM

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THE roentgen demonstration of lesions of the duodenojejunal junction is ordinarily difficult because this region is overlapped by the barium-filled stomach.

By means of the duodenogram an outline of the entire duodenum, including the duodenojejunal junction, may be obtained, unobscured by the stomach. This is done in the following manner: A duodenal tube is swallowed until the end reaches beyond the duodenojejunal junction. The last 10 inches of the rubber tube contain numerous perforations. This perforated portion is joined to the remainder of the tube by means of a small metal connecting piece. This is done so as to ascertain whether the beginning of the perforated portion corresponds to the beginning of the duodenum. After the position of the tube has been localized by fluoroscopic examination and the end is beyond the duodenojejunal junction a thick barium suspension is injected through the proximal end. On reaching the numerous perforations in the distal portion of the tube, the barium escapes through these fairly simultaneously. The entire duodenal curve, including the duodenojejunal region, is thus completely filled with the barium suspension. A roentgenogram is obtained immediately. In this way, the entire duo-

FIG. 1. The arrow points to the diverticulum as noted by means of the ingested meal method. This simulates a perforating gastric ulcer.

FIG. 2. The arrow points to the diverticulum as noted by means of the duodenogram. It is noted springing directly from the duodenojejunal junction, and is clearly differentiated from a possible perforating ulcer of the stomach.

denum including the duodenojejunal junction is visualized, without being obscured by the overlying barium-containing stomach.

It is reported that duodenal diverticula occur much more frequently anatomically than radiographic findings would indicate. The difficulty of clearly visualizing the entire duodenal curve by the ordinary method of first filling the stomach may partly account for this discrepancy.

A duodenojejunal diverticulum may simulate a perforating gastric ulcer, when it occurs in close proximity to the lesser curvature. Haudek has referred to this possible confusion.

By means of the duodenogram, it is possible to differentiate clearly between a diverticulum and a perforating ulcer in a doubtful case. Figure 1 represents the appearance of the diverticulum, as noted by the ingested meal method, simulating a perforating ulcer of the lesser curvature. In Figure 2 by means of the duodenogram the origin of the diverticulum is clearly demonstrated as springing from the duodenojejunal junction.

[SURGICAL SUGGESTIONS]

CHRONIC stasis and dilatation of the duodenum involving the third portion, and produced at or by the passage over the gut of the superior mesenteric vessels, is a real entity, anatomically and clinically. Although the condition is one that is mostly found in visceroptotics who are, or who are usually accused of being, neurotic it sometimes causes such severe symptoms, persistent vomiting and loss of weight, as to require operation.

WHEN the duodenum is much dilated duodenojejunostomy is easy and is the best operation for chronic duodenal obstruction. Gastrojejunostomy does not meet the indications and, in such cases, plication of the gastrohepatic omentum cannot be depended upon to overcome obstruction.

IT IS well to remember that a gas gangrene infection may occur in tissues more or less gangrenous from other causes, e.g., arterial disease. A penetrating and unusually offensive odor of putrescence and the escape from the tissues of a few bubbles of gas are significant of this infection.

BLEEDING FROM THE GASTROINTESTINAL TRACT CAUSED BY BENIGN POLYPOID TUMORS: REPORT OF CASES

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WHEREAS the common lesions of the stomach, ulcer and carcinoma, are recognized with a fair degree of certainty, the more unusual benign tumors commonly pass unnoticed and very frequently are first discovered either at operation or necropsy. One of the reasons for this has been that because of their comparative rarity, benign tumors of the stomach are usually not considered in the differential diagnosis; and when ulcer and cancer seem to be excluded from the clinical picture, the cause for the anemia is usually sought for in other channels. Unfortunately, many cases of secondary anemia reach a severe state because of failure to thoroughly investigate the stool for blood. Although commonly the source of the bleeding from the gastrointestinal tract can be found, there are cases in which, after a most thorough and careful study, even exploratory operation fails to reveal the bleeding point. These cases are of special interest because the outcome is almost entirely dependent upon accurate diagnosis; the location of the lesion having been found, the procedure is relatively simple and leads to the complete recovery of the patient.

The location of the bleeding point must be determined by a process of exclusion. The unrecognized cases of severe secondary anemia developing from bleeding hemorrhoids are still too frequent. This source should be immediately excluded. Polyps in the rectum and sigmoid should be excluded by proctoscopic and sigmoidoscopic examinations. The upper respiratory and digestive tract should be investigated and varices of the esophagus excluded. In this manner the zone of possibility becomes gradually narrowed.

Balfour and Henderson[1] report 38 cases of benign tumors of the stomach that have come to operation in the Mayo Clinic. Fourteen of these were fibroadenomatous polyps, 23 were fibromas, myomas and myxofibromas. There were 4 hemangiomas and 4 cases of gastric polyposes. They regard anemia as the most frequent as well as the most important sign. An acute secondary anemia from gross hemorrhage occurred in a number of cases. The only physical findings suggestive of benign tumor occurred in those cases in which the tumor was large enough to be palpated. Differential diagnosis was dependent upon fluoroscopic examination. In 92.6 per cent the roentgenogram revealed the lesion. In the treatment they employed blood transfusions freely and operated under local anesthesia when necessary. The procedure used was transgastric removal through an incision in the anterior wall of the stomach, and division of the pedicle by cautery. In the large tumors partial gastrectomy was necessary.

It is stated that confirmed cases of gastric polyposis are comparatively unusual, although reports of isolated cases of the disease have appeared from time to time in the literature. One writer has found only one case of gastric polyposis in 8000 gastric lesions, another found 14 cases of gastric polyps in 600 necropsies, and collected 8 others from the earlier literature.

DuBray[2] is of the opinion that the disease is more frequent than the reports mentioned above would indicate. He

believes that some of the obscure conditions of the stomach, masquerading under such diagnosis as chronic gastritis, gastric neuroses, etc., might, on further investigation, prove to be benign tumor conditions of the gastric wall. While there are several varieties of benign tumors of the stomach, DuBray says it is safe to assume that, of the primary forms, the polyadenomas and papillomas form the important clinical groups. He adds that two varieties of gastric polypoid conditions have been described, depending on whether the ducts or the fundus of the gastric glands are involved. When the ducts principally are involved, the tumor is distinctly lobulated, and cysts are more common; but when the alteration is chiefly in the fundus there is little or no lobulation, and the cysts are either few in number or entirely absent. He also believes that there is nothing pathognomonic in the symptoms of gastric polyposis, but at times, certain suggestive evidences of the disease are noted. Many of the cases are discovered only at autopsy, and this fact demonstrates its frequently silent nature. At times, however, occult blood is found in the fasting contents of the stomach and in the stools, and the patient shows signs of chronic secondary anemia.

Bassler[3] states that in the large pedunculated growths the polyps may act as a ball-valve, more or less completely occluding the pylorus. The diagnosis may sometimes be made by noting detached polypoid fragments in the stomach washings. When extensive polyposis exists, achylia is usually present. In one of Bassler's cases, gastroscopic examination shows the entire lining of the stomach covered with polypoid masses.

Fig. 1. Photomicrograph showing benign adenoma. The glands are hypertrophic but the cells show no atypical changes.

Fig. 2. Photomicrograph showing beginning adenoma malignum. There is marked overgrowth of the glands. The cells are atypical. One minute focus shows beginning infiltration.

According to Bryan,[4] certain investigators believe that polypoid tumors of the stomach develop on the bases of chronic inflammation; and one writer has conclusively demonstrated the gradual transition from gastritis through adenoma to carcinoma.

CASE REPORTS

H. S., unmarried female. Symptoms began in 1909 when she was thirty-three years of age. There were spells of pallor, vertigo and syncope. There was an occasional attack of enteritis. In 1911 a gastroenterostomy was performed for a supposed peptic ulcer which had evidenced itself by epigastric pain and melena. This

operation failed to relieve her symptoms and bleeding persisted.

In 1915 there were marked weakness, pallor, loss of weight, hematemesis, melena and mucus in the stools. The heart and lungs were negative. She complained of epigastric pain and tenderness. The gastric contents after the Ewald aspiration showed a free hydrochloric acidity of 0 and a total acidity of 5. The hemoglobin was 60 per cent (Sahli). The stool was positive for occult blood. She lost 11 lbs. in weight.

The *x*-ray examination at this time showed a slight delay of barium through the cardia with a cauliflower defect at the cardiac half of the posterior wall of the stomach. There was a patent stoma and the stomach was completely empty in four and one-half hours. A strict dietary régime failed to improve the patient's condition. There was gradually increasing weakness and pallor and occasional severe attacks of hematemesis and melena. In 1918 her condition became critical and the patient was sent to the hospital. Repeated gastrointestinal hemorrhages reduced the hemoglobin to 32 per cent and transfusions were resorted to.

On November 15, 1918, a laparotomy was performed. The stomach was opened and a large cauliflower-like papillomatous growth involving the posterior wall of the cardiac half of the stomach was found and removed. The patient made an uneventful recovery and gradually regained her weight and strength. All symptoms were completely relieved. Examined on March 22, 1927, she had held her former weight, her hemoglobin was 84 per cent, and her general condition was excellent.

I am informed of another case of interest in this connection illustrating the same difficulties in diagnosis, in which the lesion was found in the small intestine:

Female, aged nineteen, has had a moderate grade of anemia for seven years, during which time she had been treated under various diagnoses. Four years ago blood was first found in the stools, but no definite lesion in the gastrointestinal tract could be demonstrated in spite of careful examinations. For a period of six months before admission, bleeding from the gastrointestinal tract became so marked that the hemoglobin fell to 23 per cent (Sahli). The persistent bleeding from the gastrointestinal tract and the continued downhill course of the patient necessitated a prompt exploratory operation to determine the source of the bleeding. This was done under local anesthesia, after blood transfusion. The general condition of the patient contraindicated a complete exploration of the entire gastrointestinal tract. A small nodule which did not feel like an ulcer was palpated on the posterior wall of the stomach near the pylorus. This nodule was excised and gastroenterostomy was performed. The patient made an uneventful recovery from the operation, but blood in the stools persisted and the hemoglobin again fell to 20 per cent. After two more blood transfusions it was decided, on consultation, that in order to prevent death from hemorrhage a second exploratory operation was urgent.

At the second operation the gastroenterostomy was found in good working order. The ligament of Treitz was located and palpation of the entire length of the small intestine was begun, gradually withdrawing and replacing the loops of bowel. When the middle portion of the ileum was reached a firm mass was discovered in the lumen. Incision in the intestine exposed this mass, the size of an English walnut, attached by a narrow pedicle to the wall of the intestine. The surface was granular, ulcerated and bleeding. The tumor, which proved to be a benign polyp, was easily removed with the cautery and the ileum was closed with interrupted sutures. The patient made an uneventful recovery. Repeated examinations of the stools for blood were negative. The hemoglobin gradually returned to normal.

DISCUSSION AND CONCLUSIONS

1. Persistent bleeding from the gastrointestinal tract is frequently caused by benign tumors of the stomach or intestines.

2. The common benign tumors in the stomach and intestine which give rise to persistent bleeding are the papillomas and adenomas.

3. The detection of these lesions is frequently difficult because of lack of physical signs; and, in the small intestines, because of negative roentgenographic findings.

4. The most thorough diagnostic methods may fail to discover the source of the bleeding and even exploratory

laparotomy, when not complete, often fails, to locate the lesion.

5. In all cases in which the source of persistent gastrointestinal bleeding has been narrowed down to the stomach and intestines, early exploratory laparotomy is indicated. The chances for recovery are improved by preoperative and postoperative blood transfusion when necessary, and the employment of local anesthesia where practicable.

6. At operation there should be no hesitancy in opening the stomach in search for the bleeding point. One of the cases cited illustrates the importance of carefully exploring by palpation the entire length of the small intestine for the source of bleeding.

7. Malignant changes in single papilloma or adenoma of the stomach or intestine may occur and this furnishes an additional indication for early detection and removal.

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[SURGICAL SUGGESTIONS]

A MILD and limited gas gangrene infection may at any moment take on a fulminating and rapidly fatal course.

IN *acute* osteomyelitis, extensive gutter osteotomy is not necessary, and scraping out the cancellous bone is to be severely condemned. Drainage can be provided through drill holes (trephinage) of sufficient size and number, or through bipolar trephinage, and suppurating medullaris may be adequately evacuated with gauze wipes or irrigation, or may be left to drain out.

ACUTE ABDOMINAL DISASTERS

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UNDER this title I mean to include those pathological processes within the abdomen which, if not combatted by the surgeon, will surely result in death. I wish to exclude those diseases that are distressing and in a measure dangerous but in which the attendance of the surgeon is not emphatically required.

Some surgeons are satisfied to make a diagnosis of an acute surgical condition within the abdomen, allowing the details to be worked out after the abdomen has been opened. Unfortunately, often this is the best we can do but, if possible, an accurate diagnosis should be made, for on this the proper planning of the operation rests. If the incision is improperly placed additional trauma must be inflicted and additional time consumed. If local anesthesia is to be used an accurate diagnosis is imperative. In fact local anesthesia is contraindicated unless the surgeon is reasonably sure of his topographic diagnosis.

Since even after exhausting our diagnostic skill we may be mistaken, the operation partakes more or less of the nature of an exploration. Unless one has a clear understanding of the relation between the pathological condition and the symptoms he may still be confused after the abdomen is open. The surgeon must know, once he has the lesion in hand, whether or not it is responsible for the patient's complaints. During the years I engaged in pathology it was nothing unusual to perform an autopsy after the surgeon had operated on the wrong thing.

I propose, because of this experience, to discuss the diagnosis after the abdomen is open as a supplement to the clinical discussion. I shall divide the abdominal disasters into two groups: First, the perforative group, which includes the diseases or trauma of the hollow viscera, the stomach and duodenum, the appendix, the gall bladder, and the intestines, small and large. Second, the thrombotic group, in which there is no solution of the continuity of the visceral wall resulting in an acute general peritonitis as obtains in the first group but there is injury to the walls due to disturbance of the circulation. In this group is included those conditions in which circulation of the blood is interfered with. Acute pancreatitis, intestinal obstruction, thrombosis of the mesentery, tumors with twisted pedicles, hemorrhage into a cyst or tumor, gangrene of the appendix and the like make up this group.

I group the disasters into these two divisions because I wish to emphasize the fundamental pathology in the beginning of the symptoms. In the perforative type the initial pain is due to the irritation of the gut wall and parietal peritoneum by the escaped contents. The peritonitis appears later and dominates the field. In the second group the pain is due to the presence of clotted blood. It is the pain of dying tissue. Profound constitutional disturbance is and remains the chief factor in pancreatitis, intestinal obstruction, in fact any injury in which extravasated blood plays a part. Inflammation follows after a time, but rarely suppuration unless, indeed, perforation follows as the result of gangrene.

I want to emphasize at the outset that in the diagnosis of abdominal disasters one must consider the time that has elapsed since the onset of the disease. If seen in the first few hours the picture is quite different from that we encounter after a duration of many hours or several days. One must have a thorough understanding of the life history of the disease in order that one can diagnose the condition at the time the patient is first seen.

It is necessary to secure a clear under-

standing of the earliest symptoms in order to determine the point of beginning and therefore an idea of the organs involved. Generally speaking, the point of maximum pain at the outset will indicate the organ which is the seat of the disease. After some time has elapsed the infection may spread, and with this spread the picture may change.

In the perforative group, in which the important factor is the ensuing infection, the incision must be placed at the site of the lesion; otherwise the infection will be carried to non-infected regions, thus adding much to the burden the patient must bear. On the other hand, in the thrombotic group we are not dealing with an infection but with a disturbance of the mechanics of the circulation. We may carry the affected region across the abdomen without adding to the burden the patient has to bear.

Diseases Outside the Peritoneal Cavity Simulating Intra-abdominal Diseases. Before beginning the discussion of the two groups above enumerated it is necessary to consider those diseases from which the disasters must be differentiated. Confronted by what appears to be an acute surgical disease of the abdomen I always ask myself, "Is the trouble really in the peritoneal cavity or is it an extraperitoneal disease? If it is within the peritoneal cavity, is it one of the surgical disasters or minor acute abdominal pain?" In this group I would include gall-stone colic, acute appendicitis, tubal abortion and less common affections of like severity. If it belongs to this group I allow my assistants to work up the case and look at the evidence later. If the condition is one belonging to the abdominal disasters, the problem must be solved at once.

We may first consider the extra-abdominal diseases that may simulate abdominal crises.

Thoracic Disease. Diseases within the chest may produce pain referred to the abdomen, provided the parietal pleura is irritated. This is notably true in children. The distinctive feature is general abdominal pain not distinctly localized and most pronounced along the distribution of the tenth, eleventh and twelfth intercostal nerves. The rigidity is not as pronounced as in peritoneal inflammation. The tenderness is superficial, often most pronounced when a fold of skin is picked up between the thumb and finger. After the confidence of the patient is obtained it is noted that deep pressure does not increase the pain as in peritoneal inflammation. This sign is more easily elicited after a hot wet pack has been placed over the abdomen for half an hour. When the diaphragm is irritated there may be pain in the neck transmitted to the third and fourth cervical nerves by way of the phrenic. These pains are aggravated by deep breathing or cough. In pneumonia the leucocyte count is often higher than is ever seen in early peritonitis.

Examination of the lungs early in the course of the disease may disclose only a hyperresonance, often crepitant râles, and in later cases an area of dullness can be made out. The latter must not be depended on unless the disease is of some days duration. In adults an important sign is the rapidity of the respiration and the height of the temperature. In children it must be remembered that the height of the temperature is greater in proportion in peritoneal disease than in adults. The most common cause of error is the failure to examine carefully the chest, particularly the posterior portion. In children fortunately upper abdominal diseases are exceedingly rare and the chief concern is the possible presence of an appendicitis. The presence of bladder disturbance even to retention may be present in appendicitis in children which is not a part of chest diseases. Rectal examination may reveal a resistance near the pelvic border.

It must not be forgotten that thoracic and abdominal disease may coexist. A case in point: An ex-athlete weighing 230 pounds was taken during the night by

excruciating pain located in the mid and right abdomen. Half a grain of morphine secured only partial relief. The onset of the pain was preceded by a chill. His physician found him with a temperature of 104°c. and a respiratory rate of 38, the abdomen distended. When I saw him on the second day his respiratory rate was 40, the temperature 104.2°c. There was distinct dullness in the lower right lobe but without friction rubs. Obviously the patient had pneumonia. The abdomen was distended, with slight rigidity in lower right rectus and some deep tenderness. Obviously the severe abdominal pain would not be dependent on a pneumonia, most certainly not without a coexisting pleuritis. The severe pain and the slight abdominal signs did indicate a gangrenous appendix. Operation revealed a gangrenous appendix approaching necrosis.

When a considerable probability exists that so serious an abdominal lesion as a necrotic appendix, a perforation or an obstruction complicates a pneumonia, exploration should be done, in such cases of course under local anesthesia.

Cardiac Disease. Pericarditis and anginas sometimes produce pain of considerable intensity in the epigastrium and even lower in the abdomen. Usually in angina pectoris there is a history of previous attacks. When a portly old man is seized by an intense pain soon after eating a hearty meal one thinks first of pancreatitis. Following exertion one naturally thinks of angina pectoris particularly if there is pain down the left or even the right arm. In angina the patient usually is reclining or sitting in a chair. The patient with pancreatitis lies down. The face of the anginal patient is pale, not ashen as in pancreatitis. The wild eyes, pale sunken features gives credence to the patient's expressed fear of death. In most instances the patient will have recovered from his anginal attack spontaneously before the surgeon arrives. If the patient has received morphine the cause of the amelioration of symptoms may not be perfectly clear. Ordinarily examination of the heart gives evidence of disturbance but many men of past middle life have cardiac and vascular changes before they have either an anginal attack or an acute pancreatitis. When at all possible the responsibility should be placed on an internist. They pass the buck to the surgeon so often and here is a chance to square accounts.

Sudden decompensation of the heart with distention of the liver has been confused with gall-bladder and appendiceal inflammation. Palpation of the liver and examination of the heart usually clarifies the situation. The symptoms are not severe enough to simulate an abdominal disaster and few would be tempted to operate on a simple appendicitis or gall-bladder colic when there is any doubt as to the condition of the heart. Error here is possible only when the heart is forgotten.

There is even less excuse to confuse a pericarditis with severe abdominal disease. Careful examination of the heart should solve the problem but when the patient is deeply under the influence of morphine the surgeon may have some anxious moments particularly if everything is all set when the surgeon arrives.

Genitourinary System. Renal stone and hematogenous infections of the kidney are most apt to simulate serious abdominal diseases. Renal colic in its typical form is fairly characteristic but there are so many variations that a knowledge of the typical picture is of little use in half the cases. Only about half of the cases have the typical pain and tenderness in the kidney region. It may be most noted in the region of the gall bladder, or over the entire abdomen, or in the lower abdomen only, or even on the unaffected side only. Conversely the pain of gall-stone colic may be felt in the kidney region. I once saw a distinguished surgeon cut down on a kidney three times in one week to find gallstones instead of a kidney stone. That was before the days of the roentgen ray and visualization of the gall bladder of course. With all our refinements it is still possible to be wrong

in whole or in part. Blood in the urine is absent in half the kidney stones and is present in many of the disasters within the peritoneal cavity. The error I fear most is the confusion of a gangrenous appendix with a renal colic. A very severe pain which subsides with or without a hypodermic characterizes them both. In both, the abdomen is usually somewhat sensitive to pressure. The roentgen ray may show a stone or a rectal examination may show pelvic peritonitis indicating an appendicitis but a low stone may leave sensitiveness here. After all the evidence is sifted and there is still doubt I am quite willing to remove the appendix and see how it looks.

It may seem ridiculous to mention uremia in this category. I once operated upon a woman brought to the hospital with severe epigastric pain, distention and vomiting. The history indicated a long-standing disorder of the stomach. The urine was reported normal but of light specific gravity. The autopsy showed kidneys not larger than walnuts, the smallest kidneys I have ever seen, and viewed in retrospect they grow smaller still. I mention here, with a feeling of pride, that I have never diagnosed a Dietl's crises. I have studied the kidney and ureter and I am sure it is not possible to so kink the ureter sufficiently to occlude its lumen.

Hematogenous affections of the kidney usually present a stormy beginning. The temperature is usually too high for an intra-abdominal crisis. Deep tenderness in the renal triangle is usually very characteristic. If one remembers that the urine may be normal the first few days, in the kidney infection, error is not likely.

Testicular inflammation when associated with inflammation of the lymph gland at the border of the pelvis may simulate an intra-abdominal inflammation. Therefore the testicle should always be examined. Prostatitis, particularly acute seminal vesiculitis, may cause severe referred pain. Patients with one of these affections may give wholly misleading histories particularly if members of their family are present. It is rare that diseases in this region are severe enough to simulate abdominal disasters. The patient may complain vociferously enough but he does not look the part.

Injuries to the Spine. With rare cases of injury to spine or ribs which involve the spinal nerves may be associated abdominal pain and tympany. Fever, leucocytosis and true muscular rigidity are absent and the tympany arises too early to be due to a peritonitis. When associated with traumatism sufficient to produce shock the differentiation from a visceral lesion may be difficult. If the lesion is a pinching one, as being caught between two heavy objects or run over by a heavy vehicle without associated injuries, exploration is advisable if there is an ascending leucocytosis. The exact analysis of the nature of the trauma is of the greatest aid.

Diseases of the Nervous System. Tabes not infrequently produces a series of symptoms which suggest severe abdominal disease. Sometimes a history of indefinite pains in the epigastrium associated with pain between the shoulders suggests ulcer. If on this history severe epigastric pains supervene one may be led to think of a perforating ulcer. Careful examination of the nervous system will make the diagnosis clear but this requires talent not always available. Usually a superficial examination will save the error. It is recorded that a tabetic patient may actually have a perforating ulcer. This possibility, however strong, would induce few surgeons to operate on a patient afflicted with tabes.

Lead colic may simulate an abdominal crisis. I once attended a young painter who fell from his ladder writhing with pain in the abdomen. I did not operate on him because the master painter made the diagnosis of lead colic. I recalled he rolled about in his lamentations in a manner not imitated by those who have a perforation and the cold, beaded brow was not in evidence. Examination of the gums and blood should give evidence of lead poisoning.

Minor Intraperitoneal Affections. This

group of affections I shall not consider. It includes gall-stone colics, cholecystitis, inflammation of the appendix and the great group of pelvic diseases. They rarely cause great difficulty in diagnosis and they are not emphatically surgical. There is sufficient time to permit examination. Those cases which simulate grave diseases will be considered in connection with the differential diagnosis of the major diseases.

MAJOR INTRA-ABDOMINAL DISEASES

Perforative Diseases. As above indicated these will be considered in two groups, the perforative and the thrombotic. It is important, let it be emphasized, that these be separated because on this depends proper planning of the operation. In perforation it is highly important that the incision be placed over the point of perforation. To place it elsewhere is very apt to be a fatal error. In the thrombotic type exact localization is frequently impossible nor is it important for we are not dealing with an infection and the wide exposure of the peritoneal cavity is not attended by any considerable additional danger.

Perforations of the Stomach and Duodenum. In every language the superlative adjectives have been commandeered to express the intensity of pain associated with perforation in this region. The French apply the word "diabolical." Considered in its historical sense it is about as expressive as any. The words "awful, terrible, unbearable," assume a new meaning when pronounced by patients in the throes of an acute perforation. In a typical case the patient is suddenly seized with intense pain in the epigastrium. The pain at first comes in paroxsyms. In the periods of lesser pain the patient lies panting with a look of anxious apprehension on his countenance. "There comes another!" he cries as he writhes in renewed agony. In some cases the patient falls as if shot. The face becomes blanched, the eyes wide, the pupils dilated, and the beads of cold perspiration on the brow aid in depicting the look of terror on his countenance. The pulse is rapid and threadlike, the abdomen is flat and boardlike but not tender to the touch, though the patient wards off the examining fingers fearful that any manipulations will increase his sufferings.

I once opened an abdomen under local anesthesia in this acute stage. An opening in the duodenum came promptly into the operative field as soon as the peritoneum was incised. With the onset of the pain a jet of cloudy fluid spurted from the opening, and the surrounding intestinal coils and the stomach contracted to the most extreme degree. With the temporary relaxation of the spasm the pain partly subsided. Suturing the hole and the covering of it with omentum did not increase the pain.

The signs of inflammation in this early stage are absent. The initial pain would seem therefore to be primarily a spasmodic one, the spasm being induced by the irritation of the peritoneum by the irritating fluid escaping through the perforation. When not operated on in this early stage the fluid continues to escape and trickles down the water-shed of the great omentum and colon, producing irritation of the peritoneum as it goes. Commonly some of the fluid reaches the pelvis.

After some hours the symptoms of peritonitis dominate the field. Rise of temperature begins, distention and muscular rigidity appear, and if the escaped fluid reaches the pelvis signs of irritation of this region may be marked. The appearance now is that of a peritonitis, and when the patient is first seen at this time the problem is to determine the cause of the peritonitis. This can be determined only by the proper evaluation of the early symptoms.

History should make the diagnosis easy. There are two difficulties that may be encountered. Not all cases begin in this acute manner. Stomach perforations particularly may be partly protected by adhesions, making the onset less dramatic. The physician may promptly administer a hypodermic of morphine, and as the right abdominal pain advances he diagnoses appendicitis, and the history given the

surgeon concerning the epigastric pain may be minimized to fit the epigastric pain generally believed characteristic of beginning appendicitis. In such cases it is necessary to break through the professional barrier, and hear the patient's or a friend's account of the first symptoms.

Examination shows muscular rigidity extending from the epigastrium to the pelvis involving the whole right half of the abdomen, and if the pelvis is reached by the exudate, the lower part of the left rectus as well may be rigid, thus mimicking a primary pelvic disease. An acutely inflamed appendix lying lateral to the colon and approaching the liver may give rigidity of the whole right side of the abdomen but the general course is not as stormy as in an acute perforation. It may closely simulate a slow leak.

Intermittent perforation may present a confusing picture. Not infrequently the impending perforation may be so protected by adhesions so that only a small amount of fluid escapes. The initial pain in such cases may be that of a local inflammation only, a perigastritis which it is in fact. The small amount of fluid escaping may find its way to the pelvis and there set up an inflammation which may appear to be the major lesion. I once mistook such a condition for an ovarian cyst with a twisted pedicle, so big and round was the inflammatory conglomerate produced. More commonly the inflammation simulates an appendicitis. When operating in such a case the surgeon must know whether or not the local changes found in and about the appendix explains the symptomatology produced. In my pathology days I did several autopsies after the surgeon had removed the appendix never suspecting the presence of a perforation higher up.

The perforation may be so walled off as to prevent all but a local abscess. The large amount of inflammatory exudate may so deform the stomach that a malignancy is diagnosed. The process may be so slow that neither a rise of temperature nor a leucocytosis may be detected even after the process has continued for some weeks. In such a case it is not a perforation thanks to the protective action of the surrounding peritoneum.

Diagnosis with the Abdomen Open. When an abdomen is incised through the right rectus the pyloric region is exposed. Usually an exudate is at once encountered, and usually the site of perforation comes readily into view. In the very rare perforations posteriorly the lesser peritoneal cavity is the recipient of the stomach contents. If this is the case one must consider a pancreatitis. An examination of the omentum will show the absence of fat necrosis, and there is no evidence of hemorrhagic infiltration of the pancreas. Sometimes when the fluid does not appear at once in the region of the pylorus an examination of Morris' pouch and the water-shed of the great omentum may show the exudate. This is particularly true when an ulcer has slowly perforated and has become closed by secondary adhesions. Should the operator have made the error of assuming an appendicitis existed, the exposure of the appendix will show an organ in which there is insufficient reaction to account for the severity of the symptoms. Only a gangrenous appendix can produce the acute pain that can compare with a perforation of an ulcer. Often the exudate so irritates colon and appendix that they are reddened and increased in thickness. Such an appendix does not produce pain that can simulate an acute perforation.

Perforation of the Gall Bladder. The differentiation between a gall-bladder colic and the beginning of a perforation may not be so easy. Usually the perforation comes on after a cholecystitis has existed for a number of days. If the site of impending perforation is partly walled off before the actual perforation begins, the process may be gradual, and it is only the extension of the pain downward along the colon that indicates a perforation. It was my opinion until recently that when the

inflammation extends as far as the pelvis a perforation has most surely taken place. But it is not so. The inflammatory exudate, non-infective from an intact but thrombotic gall bladder, may reach the cul-de-sac without there being a perforation present. How then shall we differentiate? I do not know. This is one of the conditions in which the fates design to down the surgeon, and he is helpless and must proceed with an uncertain diagnosis. When there is a sudden pain or a marked exacerbation of the pain in the hepatic region, and there is evidence of an inflammation extending downward to the pelvis, the surgeon had best proceed to operation.

When a necrotic gall bladder gives way there is usually a surcease from the colicky pains for some hours and the patient feels relieved until a generalized peritonitis begins. When the wall suddenly gives way with a rapid extension of peritonitis it may or may not be accompanied by evidence of shock. Such a sudden perforation of the gall bladder is more rare. In such instances I see no way in which a differentiation can be made from a duodenal perforation. A case in point is that of a man who had a perforation while in my hospital visiting a brother who had had a cholecystectomy performed a few days before. As he was leaving the hospital he dropped on the steps because of an excruciating pain in the right upper abdomen. An unqualified diagnosis of a perforation of a hollow viscus was made and the duodenum was suspected. He was taken at once to the operating room and a right rectus incision made. A hole near the fundus of the gall bladder was found from which purulent bile and stones had already escaped. There was no inflammation, not even a hyperemia. The irritation of the escaping contents must have been the cause of the extreme pain, since inflammation had not yet begun. In this case gangrene of the gall bladder had not taken place. The accumulated gall-bladder contents had burst the friable necrotic wall.

Diagnosis with the Abdomen Open. Usually the presence of bile or a greenish purulent fluid appears as soon as the abdomen is opened. Sometimes when the perforation takes place through one or more openings and the exudate is cloudy one may think first of a duodenal perforation. However in such cases the gall bladder is thickened and there are usually new or old adhesions to the gall bladder. A careful inspection at the point of attachment of these adhesions will show the small openings through which the gall-bladder contents are escaping. It is a good rule whenever there is any doubt as to the cause of an abdominal crisis to look for fat necrosis for not infrequently pancreatic disease follows or is associated with pronounced gall-bladder disease.

Appendicitis. I wish to include in this category only the gangrenous and perforative type. The average case of acute appendicitis cannot be regarded as an abdominal emergency.

My memory goes back to the days when operation was not the rule and the mortality was not great. Appendectomy is generally regarded as the proper field for the beginner. This is true for the mythical chronic type. The operation for acute appendicitis in my judgment taxes the resources of the surgeon more than any other common lesion within the abdomen; and unless a skilled surgeon is at hand the patient is better off under the protecting wing of his family doctor.

Gangrenous appendicitis is another matter. Here unless relieved by operation the patient will surely die. This type of disease is characterized by sudden very severe abdominal pain generally diffuse at the beginning. Let it be repeated that the one important diagnostic point is the very severe pain at the outset of the disease. After a period the pain subsides and there is but little reaction in the region of the appendix. The temperature may be but little elevated, and the pulse but little increased in rate. There is usually slight discomfort in the appendiceal region but

no actual inflammatory reaction. The reason for the subsidence of the symptoms is that owing to the occlusion of the appendiceal artery the whole appendix dies, and dead tissues transmit no pain. It is not until the necrotic tissue separates and the contents escape that generalized peritonitis begins. The dead appendix does not excite the surrounding peritoneum to preparatory reaction, and the intestine contents is poured into the unprotected peritoneal cavity. Hence the almost universally fatal results.

In the beginning this type of appendicitis really belongs to the thrombotic type, but because perforation will sooner or later occur it is included here. Because of the death of tissue this type closely resembles intestinal obstruction or mesenteric thrombosis in its early manifestations. The subsidence of the pain after ten or twelve hours, the absence of tympany, and certain limited local reaction, suggests a gangrenous appendix.

Diagnosis with the Abdomen Open. When the incision reaches the preperitoneal tissue there may be some edema. If this is most pronounced in the lower end of the wound the diagnosis is all but confirmed. If, however, the reverse is true, one thinks at once of the possibility that the irritation is coming from a perforation above. After the abdomen is opened the fluid will be bloody in most instances, which at once excludes perforation of the stomach or gall bladder. The appendix is sought and will be found to be big and black. If the appendix is not the seat of gangrene the bloody fluid spells intestinal obstruction, mesenteric thrombosis or some other disease disturbance of the circulation, and the surgeon must at once search toward the midian line. If on the other hand the exudate is flocculent, milky or contains food particles the incision must at once be extended upward.

Perforation of Typhoid Ulcers. In the course of a typhoid fever if there is sudden pain, particularly to the right and below the umbilicus, perforation must be suspected. If the leucocyte count before the advent of pain is known and shows a slight rise, particularly in the number of the polymorphonuclears, the probability of a perforation is established. Local tenderness likewise adds additional evidence. The condition of the patient may be such that the primary pain is not noted, and local tenderness and increased tympany may be the first evidence of perforation. Operation on suspicion is justified. Fortunately these patients lend themselves particularly well to exploration under local anesthesia. This makes the operation practically innocuous, and the surgeon need not hesitate to proceed.

Diagnosis with the Abdomen Open. A low right rectus incision best brings one to the seat of trouble. If an incision 4 or 5 inches long is made, after a thorough anesthetization with novocaine, one can lift up the abdominal wall and view a considerable area of intestines without manipulating them. Usually there is some attempt at adhesion, which guides one to the area of trouble. If not, one needs but explore the terminal yard of small intestine to find the seat of perforation.

Perforating Malignancies. Sudden pain with signs of inflammation is in evidence. To associate it with malignancy is dependent on the ability to diagnose a pre-existent malignancy. Progressive loss of weight antedating the beginning of the pain, and the general appearance of the patient are the chief guiding signs. Carcinomas of the stomach and of the sigmoid are the most apt to perforate, and initial pain in these regions may furnish the first suggestion as to the nature of the trouble.

Diagnosis with the Abdomen Open. An area of infection is encountered, and with it a thickened intestine. The question to be decided is whether the thickening is due to a neoplasm or to an inflammation. This condition is usually found about the sigmoid. Then it is a question of diverticulitis or carcinoma. In carcinoma there is thickening of the gut above a constriction or a tumor.

Perforation of Pelvic Tumors. A hemorrhagic myoma bursting through its capsule, or a rupture of the walls of a pseudomucinous cyst produces sudden pain and shock. Usually a bimanual examination reveals a pelvic tumor and the added symptoms disclose a rupture or a twisted pedicle.

Diagnosis with the Abdomen Open. In a bursted myoma bloody fluid together with a myoma will be found. If a cyst has bursted, the intestines will be found floating in a mass of pseudomucin. A tumor with a twisted pedicle will appear as a blue-black tumor often surrounded by a hemorrhagic exudate.

THROMBOTIC DISEASES

In the preceding group of diseases the fundamental factor was the escape of the fluid contents of an organ into the unprotected peritoneal cavity through an artificial opening. It is a problem of inflammation of the peritoneum. In the group now to be considered the fundamental factor is the death of tissue. Inflammation enters the problem late if at all. Therefore the evidence in these is to be found in pain and general tenderness characteristic of the peritonitis following perforation. In all of this group there is disturbance in the circulation and the extravasation of blood. This hypothesis rests on the fact that this is the only constant factor in these diseases. It simulates conditions in which thrombosis and extravasation of blood, particularly the latter, are present. In lesions within the abdomen in which thrombosis and extravasation do not take place the symptomatology characterizing this group is absent.

Intestinal Obstruction. The primary symptom in acute intestinal obstruction is to be found in the injury of the intestine wall, and only secondarily to the interference with the fecal circulation. This fact is often demonstrated clinically, for instance in intestinal obstruction by a foreign body just large enough to occlude the lumen. There are intermittent cramping pains but no vomiting and no constitutional reaction. I have observed this in a number of instances in obstruction from gallstones and once by a conglomerate of paw-paw seeds. This can be confirmed by animal experimentation. When an intestine is simply compressed sufficient to occlude the lumen by means of a lead plate, no symptoms follow immediately. Later on, peristalsis becomes more active, as one can readily observe under the fluoroscope. Following this come distention and evident discomfort. If, on the other hand, the plates are made to compress the intestine sufficiently to occlude the circulation, increased peristalsis and evidence of discomfort begin at once.

The clinical picture of an acute intestinal obstruction due to injury to the intestine, as by twisting, or pinching, is that of a sudden severe pain accompanied by general constitutional disturbance. The pain is spasmodic in character, and there is evidence of increased peristalsis. This peristalsis is the effort of the bowel to free itself from its predicament, and not due to the disturbance of the fecal circulation. This is seen clinically when but a part of the wall is pinched, as in a Richter's hernia. The bowel is not occluded at all but there is just as much disturbance in the abdomen as if there were a complete occlusion. The vomiting is reflex, and occurs whether or not there is anything in the stomach. The vomiting of obstruction on the other hand is due to the regurgitation of the intestine contents as one can readily see and smell. The violence of the pain is in general proportional to the degree and extent of intestine involved.

Therefore while the initial pain in perforation and obstruction may be alike and both accompanied by increased peristalsis and vomiting, the perforation is followed at once by evidence of peritoneal inflammation. Intestinal obstruction on the contrary is attended by increasing distention but not by muscular rigidity as in inflammation. True enough if the injured intestine can come in contact with the parietal peritoneum there will be a reaction to the circulation in the parietal peritoneum and

an associated tenderness but it lacks the muscular rigidity of peritonitis. Furthermore perforation usually takes place in certain areas as above enumerated. In intestinal obstruction, on the other hand, unless some antecedent condition as old scars or tumor is present to form a clue, one has no definite guide as to the location of the trouble. The statement that early vomiting indicates an obstruction high up, while late vomiting indicates a low lesion, is seldom of real use in a concrete case. More often it is an indicator of tissue injury rather than of location.

After a time both temperature and pulse may become elevated. Blood count and temperature is that of blood extravasation, about 12,000 white blood cells with a temperature of less than 102°C. This, it will be noted, is about the disturbance one sees in tubal abortions, ruptures of viscera, and in general following extensive operations. The pulse rate, too, is generally low, but may be high if there is sufficient disturbance to produce shock. When these signs begin one may be sure that the intestine wall is suffering injury from the obstructing agent. Small or large vessels are thrombosed and there is extravasation.

That the pain is due to the injured tissue and not to the distention is indicated by the fact that when the intestine dies at the point of obstruction the pain ceases and the patient is free from pain though the patient is still distended and vomits incessantly. This cessation of pain with the advent of necrosis often leads the patient to believe he is improving. Once in consultation in such a condition in reply to the statement of the physician that the patient was better, my assistant, the late Dr. Wuttke, gave vent to the following axiom, "A patient with obstruction who feels better without passing from his bowels is worse: gangrene has begun."

I want particularly to emphasize the importance of the anatomic changes in the gut wall because in the present intensive studies in physical chemistry investigators are prone to forget that obvious changes are taking place in the intestine wall. This is particularly important to the operating surgeon, who with tissue in hand reads in large measure the past and furture of his patient.

Diagnosis with the Abdomen Open. In intestinal obstruction unless there is some evidence to warrant a presumptive topographic diagnosis it is best to make a midline incision. Usually distended intestines protrude as the incision is made. If serous exudate greets the operator he may be hopeful that gangrene has not developed. If bloody fluid escapes he must expect to find dead intestine. In the first event he may look for a constricting band or an early twist. Usually if the distended intestine is followed the point of constriction will be found, or conversely, if collapsed intestine is followed until it meets the distended intestine the lesion will be found. This alone is not sufficient. A definite organic constriction must be found. Sometimes a part of the intestine is collapsed and a part distended without there being any constriction at all. If there is a bloody exudate necrotic intestine must be found or else the entire length searched. If no definite constriction is found other lesions must be looked for. In distention from other causes it is not unusual to find a part of the intestine distended and a part collapsed without there being any constriction. The inexperienced operator is very apt to diagnose it as volvulus. Unless there is evidence of local circulatory disturbance a volvulus cannot be diagnosed. This most assuredly is true if there is constitutional disturbance. Failing to find evidence of constriction, other causes capable of producing the symptoms presented must be sought. Fat necrosis particularly must be sought. I have seen repeatedly at autopsy cases in which a volvulus had been diagnosed and the real lesion overlooked. The most common error was an unrecognized pancreatitis. The next most common was some heart lesion. Unfortunately pathologists commonly are employed on a salary and they

are not always in a position to tell all they know.

Acute Pancreatitis. Hemorrhage into the pancreas begins with excruciating pain in the epigastrium. It may extend straight through to the back and may even be felt most intensely there. There is collapse, vomiting, and extremely rapid pulse. There is early abdominal distention without notable local tenderness. The features early become sunken and the complexion ashy.

The subjects are usually well fed males of middle life or beyond, and the attack comes most often after a full meal has been eaten. Not uncommonly acute pancreatitis attacks patients known to be suffering from gallstones. The question then arises whether or not the attack is one of gallstones. Milder degrees of pancreatic disease may precede the serious attack. If these have been diagnosed as gall-bladder attack one is apt to think first of the gall bladder, particularly of a ruptured one. Usually a glance at the patient convinces one that the attack is too acute and too severe to be from gall-bladder spasm but the differentiation from pancreatitis and perforation of the gall bladder may be quite impossible. The pain in ruptured gall bladder is in the hepatic triangle, that of pancreatitis in the epigastrium, and when it is referred to the back is exactly in the center of the back. Intestinal obstruction often is diagnosed. The collapse, very rapid pulse, the location of pain and the color is not that of obstruction. It is most closely simulated by obstruction due to volvulus. Mesenteric thrombosis most closely simulates pancreatitis in suddenness of onset, but there are no back pains and the ashen color is lacking and the patient younger. Distinguished men who die of "acute indigestion" after a banquet usually are victims of acute pancreatitis or coronary sclerosis.

Diagnosis with the Abdomen Open. When pancreatitis is diagnosed one looks first for bloody exudate, then fat necrosis in the great omentum or mesentery. Fat necrosis is one of the most characteristic lesions found in the abdomen and is the one most commonly overlooked or looked at and not seen. The whitish gray spots set in the yellow fat of the omentum or mesentery is as if a hole had been punched out and filled with caseous material (Fig. 4). Not finding either or both, the pancreas is palpated. If found normal, the gall bladder is examined. If found negative, search must be made for intestinal obstruction. If this is negative, the region of the appendix is approached, and if a lesion is found here a new incision must be made. The surgeon must not allow humiliation to overtake him if he misses a diagnosis of pancreatitis. Conversely, when operating for other acute abdominal lesions fat necrosis should always be sought for if there is any question as to the cause of the symptoms.

Thrombosis and Embolism of the Mesenteric Vessels. Any condition which occludes a mesenteric vessel of any magnitude produces a disturbance of the blood supply of the intestine wall resulting in anemic necrosis or hemorrhagic infarction. Hence the symptomatology is similar to that in intestinal obstruction, though the lumen of the intestine is not narrowed.

Pain is nearly always the introductory symptom. It is sudden in onset, diffuse in distribution, constant and dull in character, but there may be colicky exacerbations in the beginning. In some cases the pain is gradual in onset, particularly in those cases which are superimposed on inflammatory conditions resulting from some previous infection. One can make an hypothesis in such cases of the gradual occlusion of the vessel by a thrombotic mass with a good deal of confidence. Local symptoms follow when the parietal peritoneum becomes irritated by the distressed intestine.

Vomiting is common, and when the vomitus contains blood it has diagnostic significance. Diarrhea is present in the majority of cases, generally bloody in character, and when taken in conjunction

with the initial symptoms above detailed warrants a presumptive diagnosis. This sign is particularly valuable in superimposed cases, say coming on some days after operation for acute suppurating appendicitis. The initial symptoms are apt to be ascribed to acute intestinal obstruction associated with the operation and the drainage introduced. Bloody vomiting or bloody stool turns the attention to the mesentery. Distention and tenderness are associated in variable degrees but bear nothing distinctive.

Stress is placed sometimes in the search for a primary focus for an embolic process. In none of my cases has there been a cardiac lesion.

Diagnosis with the Abdomen Open. A bloody exudate is almost sure to greet the operator. The affected intestine when found may feel like a garden hose, so firm are the walls. When seen within a few hours after the onset this thickening of the intestinal walls may be absent and the blue intestinal walls the only thing distinctive. Sometimes this is so little marked as not to be noticed. The mesenteric vessels must be examined and can usually be demonstrated as being thrombotic.

Torsion of the Omentum. The majority of cases of torsion of the omentum are associated with large inguinal hernias. When a patient so encumbered has gradually increasing pain and swelling in his hernial sack with increased resistance in the lower abdomen extending upward from the inguinal region, the diagnosis is fairly easy. However the onset may be sudden. One of my patients dropped while walking along the street and had to be transported to the hospital by a passer-by. Another who long had an irreducible inguinal hernia was seized with severe pain as he stepped from a ladder in his dry-goods store. The differentiation between torsion of the omentum and strangulated irreducible omental hernia is dependent on the fact that in strangulated hernia the induration of the abdominal wall does not extend much above Poupart's ligament, while in torsion of the omentum it extends up as high as the umbilicus.

In a minority of cases the twist in the omentum occurs in the absence of a hernia. The pain is as severe as in the preceding affections. In such cases the only guiding evidence is found in the fact that corpulent individuals are most commonly affected. In my single case the back pains and rapid pulse of pancreatitis were absent but I diagnosed pancreatitis just the same. The general symptoms are severe pain widely distributed not to be distinguished from intestinal obstruction or mesenteric thrombosis.

Diagnosis with the Abdomen Open. Unless the patient is exceedingly corpulent a mass can be felt once the patient is anesthetized. Bloody fluid is always present. A hard black tumor is readily made out, which when delivered can readily be made out as belonging to the omentum. When a hernia is present the exploration of the sack shows the omentum to be black, and when delivered shows torsion to be the cause of the necrosis. Sometimes a hemorrhage into a myoma, to which the omentum had previously become attached, the huge omental vessels may suggest a torsion but by following the omentum downward the differentiation becomes easy. Besides the surgeon should know of the presence of the myoma which should suggest the correct diagnosis.

Summary. Nowhere in medicine is a working knowledge of the pathology of the living so vital as to the surgeon when confronted by the major lesions within the peritoneal cavity. Clinical diagnosis is never certain and the surgeon must be able to orientate himself quickly and certainly after the abdomen is open. Error at this point is far more disasterous than a wrong diagnosis before the operation. It is of vital importance to differentiate between an infection and one in which infection does not play a part. Thus orientated the skilled surgeon can correct minor errors

in diagnosis without detriment to the patient.

CONCLUSIONS

1. Abdominal crisis must be distinguished from extra-abdominal affections and milder intraperitoneal affections.

2. An effort should be made to distinguish between perforations of hollow viscera and conditions attended by disturbances in the circulation.

3. The best clinical observation possible must be supplemented by observations made after the abdomen is open lest a minor lesion be mistaken for the major lesion.

[SURGICAL SUGGESTIONS]

THE chronic bone abscess is an exquisite example of longevity of organisms in the tissues, of the attenuation of bacterial virulence and of the long latency of low grades of bone infection.

THE chronic bone abscess is often, if not usually, residual from an osteomyelitis active even twenty or more years before the abscess makes its presence known. Sometimes, however, it occurs as a solitary process, metastatic or even without any discovered antecedent infection.

CONTRARY to teaching still to be found in textbooks chronic bone abscesses are not usually but rarely tuberculous and are found not only in the ends of the shafts. They occur at any level in the length of the bone and in any layer of the bone-cortical, cancellar or medullary.

ABSCESSES within the compact or cancellous substance of the bone show clearly in the roentgenogram. The bone surrounding the abscess is usually of greatly increased density, but sometimes the cavity is in bone of normal or nearly normal density.

A STUDY OF GOITER CLASSIFICATION AND NOMENCLATURE*

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IN our present uncertainty regarding the etiology of goiter and the relation between its symptomatology and thyroid pathology, it seems logical to argue that the nomenclature and classification should be as simple as possible. The need for one simple classification is better understood when it is recalled that there are more than twenty classifications in use among the one hundred and forty men to whom letters were sent. No two classifications closely resembled each other and no two men, so far as could be learned, were using the same classification. No criticism is implied for any of these classifications but their multiplicity speaks for itself.

Having these things in mind I selected from the literature a simple classification into the terms of which the more complex classifications can be easily translated. This was sent to the heads of the departments of medicine and surgery of the medical schools of the United States and Canada with a letter which read as follows:

"Because of the large number of terms and the diversity of classifications offered, I am making inquiry from the leaders in medicine and surgery in this country and Canada regarding the classification which they use in their daily work.

"I am quoting below a very simple classification.

I. Diffuse Colloid
II. Adenoma
    (a) without hyperthyroidism
    (b) with hyperthyroidism
III. Exophthalmic
IV. Tuberculosis, syphilis, thyroiditis, malignancy.

"In your opinion would this classification be of value to the general practitioner who sees goiter and devotes his attention to it only as part of his day's work and not as a thing to which he devotes special attention or with which he is especially familiar?"

No claim is made that this is the best classificaton to be found or indeed that it is superior in any way to others appearing in the literature. If every doctor on the continent understood it the profession would speak one language regarding goiter, which would be a decided advantage over the present Babel-like confusion.

One hundred and forty letters were sent out. Sixty-seven answers were received. Of these fifty-two felt that this classification might well be adopted by the rank and file of the profession. Six were definitely opposed to it and nine said nothing about it but merely indicated the classification they were using in their own work.

The terms in this classification refer to gross pathology determined by the palpating hand before operation. The diffuse colloid goiter refers to a smooth uniform enlargement involving the entire gland, no nodules being visible or palpable. The gland has a smooth globular feel and only occasionally are there slight or fleeting signs of hyperthyroidism.

The adenoma refers to a gland containing one or more nodules either visible or palpable. Or the enlargement may involve only part of the gland. There are times when nodules are situated deeply in the colloid goiter and their presence cannot be demonstrated until the gland is considerably reduced in size.

The adenoma with or without hyperthyroidism refers, of course, to the functional activity of the thyroid. The tendency

* Read at the annual meeting of the American Association for the Study of Goiter. Philadelphia, February 1, 1927.

of all adenomatous goiters is to become toxic; this tendency increasing greatly after the twenty-fifth year.

In December and January last I sent to the same men to whom the classification had been sent a questionnaire regarding the use of iodine in the treatment of goiter. Accompanying the questionnaire was the following letter:

"It is realized that this discussion of iodine and goiter covers the field but superficially. If the rank and file of the profession were acquainted with the few facts enumerated here it is believed they would be in a better position than at present.

"Many men feel that the use of iodine is good treatment for some forms of goiter. Being uncertain as to the varieties in which it is useful they give it to all goiter patients, not only as a preoperative measure but for indefinite periods of time. In these cases it loses its value as a pre-operative measure so that the patient's chances of recovery are minimized.

"Goiter is a very live subject in our society because of the large number of goiters in Illinois, more particularly in that section of the state lying in the Great Lakes basin. A questionnaire is being sent to the foremost teachers in the United States and Canada in the hope that we may discover a few facts on which the leaders of the profession are agreed which we can pass on to our county societies. For your convenience a 'yes' and 'no' is arranged after each question. If you have the time to go into these questions in greater detail we shall appreciate your attention."

Sixty men replied to the letter. Twenty-three states and three Canadian provinces were represented in the answers. One man felt that too much information was asked for and so answered none of the questions. One man did not handle goiter cases and consequently felt himself incompetent to answer. Two men did not believe their experience was sufficiently broad to permit them to answer.

This leaves fifty-six men who returned answers which are tabulated as follows:

Question No. 1. Do you believe that iodine should not be used as a public health measure in the water supply or table salt?

Forty-five men indicated that they were opposed to the use of iodine as a public health measure in the water supply or table salt of a community. Nine felt that it might be used in some cases and under certain circumstances. Two men who replied to the questionnaire failed to answer this question. Of the nine who believed it might be used one man felt that the use of iodine in the water supply should depend on the definite showing of iodine deficiency in that locality, the sanction of the State Medical Society, if it were a state-wide question, and of the County Society, if it were a county question.

Question No. 2. Do you believe that public health agencies should restrict their efforts in the goiter field to educational propaganda?

Forty-six men felt that public health agencies should restrict their efforts to educational propaganda. Three were distinctly opposed to this idea. Six felt that while this restriction should be the rule, there might be certain exceptions.

Question No. 3. That they should explain to the laity that goiter is many times a preventable disease or condition: that many cases can be easily cured if properly treated early?

Fifty-three felt that this information should be disseminated to the laity. Two qualified their answer but agreed in the main with this idea.

Question No. 4. That treatment should be left to the private physician who has opportunity to make a more careful and detailed examination than can or should be made by public health authorities?

Forty-nine felt that treatment should be left to the private physician. Six favored this but felt that there might be occasions when public health agencies might enter the field. Two were opposed to this idea in part.

Question No. 5. For the guidance of the average doctor who sees only an occasional goiter case as part of his day's work, do you believe it would be wise to disseminate the idea that iodine is good treatment only for the diffuse colloid goiter?

Thirty-four felt that it would be wise to disseminate the idea that iodine is good in the treatment of only one variety of goiter—the diffuse colloid. Six agreed with the idea in part. Ten were definitely opposed to it. Four were dubious as to the wisdom of it. One omitted answer.

This question was intended to convey the idea that the field of iodine, as a curative measure in the treatment of goiter, is limited to the diffuse colloid variety and that all other should not be subjected to it, except as a pre-operative measure, as indicated by the succeeding questions.

A leader from the Pacific coast voted "yes" and in a letter amplified his answer by the statement, "In the goiter clinic where we have patients under observation for a long period of time, we have entirely discontinued the use of iodine in the treatment of colloid goiter because of its inefficiency. We are using dessicated thyroid for the purpose of putting the thyroid gland at rest. Then after it is reduced in size we give the ordinary preventive iodine. We have observed patients with small colloid goiter treated with both dessicated thyroid and iodine over periods of time, varying from six months to two years. Dessicated thyroid was uniformly efficient while iodine usually was not. Care must be taken in making a diagnosis between early hyperplasia both of the cellular and acinar (adenomatous) types as these do not yield to treatment."

This coincides with the writer's feeling on this subject. But if there be a field for the use of iodine as a treatment it must be in the variety under discussion.

Question No. 6. That the adenoma without hyperthyroidism should never be given iodine because of the great danger of converting it into an adenoma with hyperthyroidism (though an occasional case may improve on it and a few may not be made worse by it)?

Forty-eight were of the opinion that iodine should not be given to the adenoma without hyperthyroidism. Two were undecided on this point. One omitted an answer.

Four qualified their answers as follows:

"No, I don't view adenoma other than localized overgrowth. The etiological factor is the same."

"Absolutely yes."

"No, not possible."

"No, I'd leave it to the judgment and experience of the doctor with reservations in the case of physicians competent to assess the risk, etc."

Question No. 7. That iodine should never be given to the adenoma with hyperthyroidism except when the patient is in the hospital and then only for five to twenty days as a pre-operative measure?

Forty-six men felt that iodine should be used only as a preoperative measure. Three were uncertain on this point. Four were of the opinion that it was never indicated in this variety of goiter. One man who does a great deal of goiter surgery in the middle west wrote, "And the wise surgeon will rarely use it then." One man stated that he had given it to hundreds of cases of this type but had never come to any conclusion regarding its effect in this group of cases. Another said, "I doubt the use of iodine in this type of case even as a pre-operative measure."

"Question No. 8. That an adenomatous or asymmetrically enlarged thyroid with hyperthyroidism is always a surgical condition?

Forty believed this to be a surgical condition. Six were unqualifiedly opposed to the idea that this is always a surgical condition. Three of these were surgeons. One felt that an absolute "yes" or "no" was not possible. One said "yes and no; there may be many other factors to decide." Two said "yes, usually." One surgeon said "yes" to the adenomatous thyroid and "no" to the asymmetrically enlarged thy-

roid. Another felt the last six questions should be individualized and the patients seen by a specialist. Another felt that roentgen ray sometimes cured these cases. Three did not answer this question.

"Question No. 9. That an adenomatous or asymmetrically enlarged thyroid with hyperthyroidism is one of the most confusing goiters with which the practitioner is confronted because it is so frequently confused with heart disease, nephritis, high blood pressure, and "nervous breakdown," the presence of a small goiter being frequently overlooked entirely or its relation to the major syndrome being misinterpreted?

Fifty-four agreed unqualifiedly with the opinion expressed in the question. One was uncertain and one omitted the answer. This question was intended to direct attention to the thyroid in the conditions mentioned. The writer feels very sure that in these cases the presence of a small goiter is frequently overlooked or its relation to the major syndrome misinterpreted.

Question No. 10. That iodine is of value in exophthalmic goiter only as a pre-operative measure and only on one occasion. That is, while it will cause a remission of symptoms once it will rarely do so the second time, so that its use should be restricted to the pre-operative period of five to fifteen days?

Forty agreed unqualifiedly. Six agreed with reservations. Five disagreed with the idea expressed in the question. Three disagreed with some qualifications. Two were undecided.

In order to more clearly orient some of the answers and to present more accurately the viewpoint of some of the men, a few letters that accompanied the questionaire are quoted. One man wrote:

"Of course questionnaires are very unsatisfactory. You have worded these questions allowing a more satisfactory answer by 'yes' and 'no' than is usually the case, and yet the problem is so complicated that even these questions are hard to answer.

"Personally, we try out iodine for one week in every kind of goiter with symptoms unless accompanied by evidence of myxedema, in which case, of course, we use the thyroid gland itself, and at the end of a week by the patient's feelings, pulse, etc. make up our mind whether or not to continue; but we use only 3 mm. of Lugol's twice a day and so avoid the danger of the rather large doses."

Another said:

"Enclosed you will please find my replies to your questionnaire. Amplifying those replies I should like to say in answer to question No. 1 that I do not believe municipal or state authorities should be allowed to treat a public water supply until exhaustive chemical analysis has shown conclusively a deficiency of iodine content and further safe-guarded by approval of the State Medical Association in municipalities.

"In answer to question No. 5. We must realize that the 'average doctor' is a doubtful authority as to the diagnosis of 'diffused colloid goiter,' by which I understand you to mean adolescent goiter. Adenomas are sufficiently frequent in children of this age to make one look askance at a general advice of this nature.

"In answer to question No. 7. I have stated that I do not believe that iodine is indicated in a toxic adenoma, whether in or out of the hospital and without regard to the number of days preceding operative procedures. It is my opinion that iodine is absolutely contraindicated in all toxic adenomas except perhaps in the rather unusual combination with exophthalmic goiter.

"Question No. 8 raises the question of making all toxic adenomatous thyroids subject to surgical intervention. In the majority I believe that surgery is the more preferable method of treatment for these conditions, but it cannot be made an infallible rule. The degree of toxicity, the age of the patient, the presence of other conditions, which make surgery undesirable, may put a small per cent of these cases into a group where galvanism, roentgen-ray

exposures or rest with ice bag may be indicated. It has been my experience that nearly all toxic adenomas which I have seen treated by these measures will, though they improve for a time, present subsequent evidence of toxicity."

Another man says:

"The problem of the use of iodine in these cases is subject to a considerable amount of debate and is more important to you where goiter is endemic in your locality than with us where it is only occasional. Nevertheless, I have seen much harm arise from its injudicious use and it seems almost impossible to convince some members of the profession that damage can arise from its use."

Another one:

"No doubt the public health agencies should restrict their efforts to educating propaganda rather than the advising the use of iodine in various forms. This no doubt has done a great deal of harm. Furthermore, the benefit to be derived from the use of iodine when hyperthyroidism is present is somewhat questionable. Its use should certainly be restricted to a limited period and then under strict supervision preparatory to the operation."

The Dean of one school wrote, "I have wished to see that the opinion which I expressed was in fact the joint opinion of my colleagues here. The only question which I felt unable to answer "yes" or "no" is question No. 4 which I have marked with a circle, somewhat extending my opinion at the bottom of the page. Otherwise to me the questions are more or less clearly stated and should, I think, receive wide assent."

This school is in a goiter zone. The extended opinion reads, "I think the school physicians are now in a position to deal with goiter in children more effectively than are private physicians. I, therefore, raise the question as to whether this should not be regarded as an exception under this heading."

CONCLUSIONS

In the main it is agreed that iodine should not be used as a public health measure in the water supply or in table salt. Public health agencies should limit their activities to educational work.

Treatment should be left to the private physician.

Iodine should practically never be given to the adenoma without hyperthyroidism and should be given to the adenoma with hyperthyroidism only as a pre-operative measure. Many men do not believe it should be given even as a pre-operative measure to this type of goiter. Certainly its action in this type cannot be foretold as it usually can be in the exophthalmic variety.

In the latter most men feel that iodine should be reserved for use as a pre-operative measure and that it has a good effect but one time. A number of men feel that this effect may be repeated and one felt that it may sometimes apparently effect a cure.

In closing I would like to emphasize the wisdom of always investigating the thyroid in cases of "nervous breakdown," hypertension, nephritis, and heart trouble.

RÔLE OF THE HEART & BLOOD PRESSURE IN THE SURGICAL TREATMENT OF HYPERTHYROIDISM

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AS to the importance of the subject, Parry (1815), one of the first to describe the disease, exophthalmic goiter, was most impressed with its cardiac features (Karl von Basedow having given the first classical elucidation of the syndrome in 1840), and we should expect marked disturbances in the circulatory system when we reflect first that in hyperthyroidism there is a tremendous increase in the metabolic processes. This means, of course, a much greater call for transportation of oxygen from the lungs to the various body tissues resulting in a greatly added burden on the heart, which increased work can only be met through increased rate or tachycardia. There are also in this disease marked disturbances in the vasomotor apparatus of the circulatory system, so that at times a condition of hypotension may obtain while on other occasions hypertension may be present depending on whether vasodilating or vasoconstricting endocrine influences are predominating.

Furthermore, as a result of the toxemia present in this disease lesions in cardiac musculature, as fatty degeneration, perivascular round cell infiltration and focal necrosis have been found.

Alluding to damage thus sustained by the thyroid heart Hirschfelder[1] says: "Heart failure is the immediate cause of death in most cases of Basedow's disease." And Plummer states: "In the hyperplastic cases symptoms develop rapidly and more than half the cases of this type seen at the Mayo Clinic came in the first year after the onset of symptoms in which the nervous system is mainly involved. On the other hand, in the non-hyperplastic cases the toxic symptoms develop after an average lapse of fourteen years and cardiac damage then dominates the picture."

J. Shetland Goodall and Lambert Rogers[2] state that "(1) the cardiovascular condition very largely determines: (a) whether an operation can be undertaken without undue risk; (b) the nature of the operation (whether ligation, thyroidectomy, etc.). And from a paper by Goodall on "The Heart in Graves' Disease," we quote:

"(2) Long-continued mild grade of thyrotoxicosis causes more cardiac damage than a more intense thyroid intoxication for a much shorter period.

"(3) In the majority of cases of Graves' disease hypotension is present and in cases thus running a low blood pressure, the operative risk is less than in those showing arterial hypertension. (In 158 cases of arterial hypertension studied by us two years ago only three cases of affections of the thyroid were found)."

As the basis for the above opinion he states the following:

"(1) Comparatively little myocardial exhaustion (due to absence of strain of hypertension).

"(2) A slighter postoperative rise of blood pressure and therefore less risk of postoperative ventricular fibrilation and sudden death.

"(3) Less risk of hemorrhage."

On the other hand, he quotes Kocher as considering low blood pressure as a source of danger:

"If we find the blood pressure plus normal and the disease highly developed we must study the condition and especially note the action of the heart after exercise and excitement. Under these circumstances we might

find a marked dilatation of the heart, irregularity of the pulse and a blood pressure which cannot be measured by our ordinary methods. A blood pressure of 195 is not a contraindication to operation."

Goodall[3] also quotes Plummer as regarding the height of systolic pressure as an indication of the degree of toxicity.

Boothby[4] writes "In the case of exophthalmic goiter there is an average high systolic pressure, but a rather low diastolic pressure, giving a high pulse pressure. This combination coupled with an increased blood flow indicates a relatively open periphery."

After the above papers which appeared in 1920 and 1921, there is quite a hiatus in the literature of our subject, especially in reference to blood pressure in hyperthyroidism, so much so as to prompt Willard Bartlett[5] in his recent book to say: "Studies in blood pressure seem to have been made, as far as the literature would indicate, much less frequently in connection with Exophthalmic Goiter than the condition warrants."

In fact the next contribution of practical value is that of Lahey[6] on "Goiters Complicated with Heart Disease" in which address he makes the following comments: Thyroidism damages only the hearts diseases before the onset of thyrotoxicosis, and never those normal at the time of the development of the hyperthyroidism; that the cases with normal hearts may develop marked tachycardia, but never at any time any definite evidence of cardiac failure, death in these cases then being due solely to the effect of the acute general intoxication.

(2) The secretion of either the toxic adenomata or exophthalmic goiter produces the same effect on a previously damaged heart.

(3) Thyroid intoxication produces ill effects in previously damaged hearts through so persistently urging the organ to rapid rates and so commonly causes auricular fibrillation to develop.

(4) The damaged hearts thus developing in hyperthyroidism he calls "thyrocardiac" and he calls attention particularly to such cases being frequently mistaken for ordinary cases of decompensated heart disease due to the symptoms of cardiac decompensation so overshadowing those of hyperthyroidism and thereby robbing the patient of the beneficial effects of surgical treatment.

(5) As to the diagnosis he emphasizes the frequent absence of the classical signs of Basedow's disease and says: "It is only necessary to bear in mind that the underlying 'thyroidism' is obscure and atypical, as compared with thyroidism in the young, and may often be diagnosed only after diligent search through the past history and painstaking observation of the present state." Evidently he is here referring to the group of cases known as "formes frustes."

As to operative end-results in these cases a group of 31 is reported alive two years after operation which averaged twenty months bed disability previous to operation, and at the time of reporting had averaged twenty months up and about. One hundred and forty of the cases with cardiac decompensation have been operated on with 3 operative deaths, that is deaths in the hospital, ethylene anesthesia being used.

In conclusion, he says that in his entire experience in surgery he knows of no situation when patients may be rescued from such depths and restored to such heights in terms of cardiac capacity and physical ability.

The above report of Lahey is of course quite encouraging, applied as it is to a class of cases as a rule most unpromising. Calling attention as he does to the ease with which these obscure cases of thyroid hearts may be overlooked is, we feel, most timely; for this group of cases which Trousseau likened to the defaced coin or forme fruste simulates other diseases most closely, as we had occasion recently to realize very thoroughly in quite an illustrative case—that of a physician who had

for eight years led a life of invalidism with what was considered by several able clinicians a nicotine heart, because probably he had all his life been an excessive user of tobacco. Upon hospitalizing him for intensive study we were finally able to appreciate a very slight Von Graeffe sign and also an almost imperceptible tremor in fingers. A high metabolid rate then disclosed the true nature of the cardiac affection and a subtotal thyroidectomy has afforded him complete relief of his symptoms for now over three years. He is able to play eighteen holes of golf comfortably and enjoyably. We feel that when possible all such obscure cases should be placed in a hospital where they can be kept under daily observation and study, that a correct diagnosis may eventually be reached.

While it must be considered as most important, the subject is in an unsettled state, yet from the data herein presented we may, it would seem, glean the following impressions:

(1) The cardiovascular manifestations in hyperthyroidism are of prime importance and must be seriously considered in estimating the operative risk in a given case.

(2) The condition of the myocardium should be accurately determined through careful electrocardiographic studies preceding operative interference.

(3) The disputed question as to whether the operative risk is greater with arterial hypertension than with hypotension is in a way settled by the comparative rarity of the former group of cases.

(4) The great importance of hospitalizing for careful observation and study all obscure cardiopaths to the end that the forme fruste may not be overlooked and the victim robbed of the beneficial results of treatment for hyperthyroidism.

(5) It would seem that Lahey's statement not only previously damaged hearts can be pathologically influenced by the state of thyrotoxicosis calls for further confirmation.

(6) Lahey's surgical results, however, are certainly most encouraging especially just at this juncture when the pendulum appears to be starting away from thyroidectomy.

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REMARKS UPON THE PHYSIOLOGY OF BONE IN RELATION TO BONE DISEASES*

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THERE has been allotted to me for discussion the group of bone tumors that are called benign, together with those borderline growths which clinical experience shows to have a tendency toward malignancy, in their relation to some of the newer aspects of the physiology of bone.

In presenting this phase of the subject I have planned for the most part to avoid any descriptive detail of any one type of bone growth, or of entering upon any classification based upon histology, anatomy, prognosis or malignancy; but to search behind this clinical picture screen for the cause or causes of bone neoplasm of whatever histological constituent.

I feel that it is within the scope of this assignment to present certain viewpoints which I have harbored in mind and which appear to me to be fundamental to all bone pathology.

It has seemed to me that not only the benign tumors, but also the associated diseases to which bone is subject, including the group of cystic disease, osteomalacia, Paget's disease and the inflammatory processes, although resulting from different etiologic factors, represent in the main, differences in reactive tendencies towards invasion, in a tissue whose physiology is but poorly understood.

It seemed to me also that it was a faulty starting point to assume a difference in etiology between, for instance, a chondroma and an osteochondroma, and to ascribe for each a special presiding control determining that the one tumor should consist of cartilage alone, and the other tumor cartilage with a greater or lesser admixture of bone, and to conclude that they must be of an entirely different nature; or, to reconcile the histological similarities between, for instance, Paget's disease and bone syphilis, although arising from totally different causes. It might be worth while to search for some common stock or nature, residing in bone itself, fundamental to all these pathological processes and from which all take their origin.

From this aspect, in the light of our present knowledge, such an investigation will carry one away from a consideration of the bone cell, whose function is very little known, and lead to a consideration of the intercellular material of bone, spoken of as the calcified matrix. It is this material that is the finished product we call bone, and it is here that we must seek the solution of those baffling problems presented in the pathology of bone.

This thought necessarily throws one back upon the embryology of bone, but with this phase I shall burden you as little as may be possible.

Without disgressing too far, let me remind you that in 1873 Adolph Kölliker propounded his theory of the multinucleate cells of developing bone. These cells he called "osteoclasts" and considered them the direct agents of bone resorption.

Since that date, this theory of bone production and bone resorption has found its way into medical thought and firmly established itself.

All recent investigations tend to contro-

*From the Hospital for Joint Diseases. Read before the Section of Orthopedic Surgery, New York Academy of Medicine, May 20, 1927.

vert this theory and in fact attack the very foundations of our hitherto accepted ideas of the physiology of bone.

It is largely the results of American research that have denied to the osteoclast and to the osteoblast the functions attributed to them in the development of bone. Prominent among the names of workers in this field are Lewis, Shipley, Macklin and Arey.

As stated by Arey[1]: "The conclusions of Kölliker regarding the history and signif-

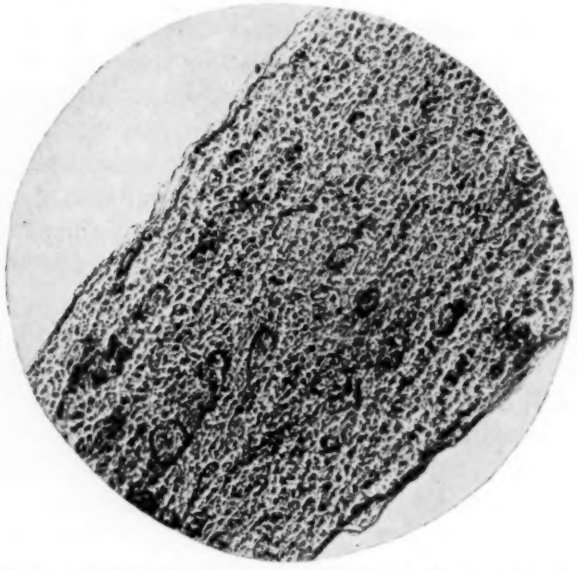

Fig. 1. Adult rat skull, full thickness, Bast method, showing lacunar cells and Haversian canals.

icance of the osteoclasts have gained great prominence. It should be kept clearly in mind, however, that his opinions were almost wholly inferential. He neither offered direct proof of the origin of osteoclasts nor of their fate. The apparent reasonableness of these deductions, and the prestige of their originator doubtless account for their acceptance by numerous later investigators and for their widespread inclusion in texts." And in his careful and elaborate study, he concludes, "In working over this field and evaluating the total evidence, the writer has become highly sceptical concerning the potency of the osteoclasts in bone resorption."

With Lewis, he would take the position that "There seems to be no satisfactory evidence that the osteoclasts are the active causes of bone destruction. On the contrary, they appear to be degenerating cells."

Concluding this digression, I would add that this theory has greatly retarded our search of the truth, and has stood as a barrier successfully staying any scientific advance to the understanding of the physiology of bone.

To me it has been astonishing to find

Fig. 2. Fetal guinea-pig skull, showing area of condensation, rich in cells, chondromucoid substance and Haversian canals. Periphery shows intercellular matrix in which lime salts will be laid. Notice avascularity of large areas.

how tenaciously the authors of many recent textbooks and surgeons of the present day, fail to incorporate the products of this newer research and apply it to their daily problems.

Approaching, therefore, the study of the structure of bone, it appeared to me that bone must be examined in its natural state and not after the introduction of the various artifices entailed in decalcification and sectioning.

I have long maintained the point of view that it is the organic intercellular matrix that is the element of bone structure that holds the key to the problems of bone physiology and not the multinucleate cells.

This organic intercellular matrix is a collagenous material, the product of a specialized differentiation of the mesenchyme, and appears to possess the unique biologic feature that I would call for want of a better term "calcium coagulation."

This collagenous material shows no cellular structure but, after the ordinary fixing methods, shows numerous long striations. Although, as just stated, there is no visible cellular structure in the organic matrix before calcification, after calcification a definite structure can be made apparent.

If sawdust is made from normal bone cortex, using a fairly fine saw, and stained by any method, the constitution and structure of the calcified matrix can be studied. Examinations have been made of such sawdust from normal human bone, pathological human bone, and bone of the ox and the rat.

In normal human, ox and rat bone there is practically an identical structure except for some trifling variation in the size of the calcified units.

The general contours of these units are spindle-shaped, sometimes lying singly but more frequently lying in rows; their length and width are uniform, the calcium distribution is diffuse and shows no evidences of crystallization. Decalcification of such bone sawdust shows the same organic matrix seen in other preparations.

Pathological bone treated in the same manner, shows the same calcified units, but their contours are irregular, many are bent or irregularly curved, the calcium is irregularly distributed and they show a tendency to bizarre shapes. There are locations where there looms into prominence in the midst of such a unit, a well-stained bone cell that is not seen in normal bone.

Fig. 3. Sawdust made from normal ox bone. Calcified trabeculae lying in rows.

Fig. 4. Bone sawdust, metastatic carcinoma. Trabeculae irregularly shaped, irregularly ossified.

These bodies represent bone trabeculae and demonstrate that calcification is not a diffuse process extending through a homogeneous intercellular material, but that there are definite and regular limitations of the pre-osseous collagenous substance which define the size and configuration of each trabecula.

It would be hazardous indeed, in our present knowledge, to call these bodies cells, even though their contours are not dissimilar to a connective-tissue cell, and though occasionally in pathological bone a structure like a nucleus has been seen.

In the attempt to study the bone matrix before calcification, it was planned to

employ the agency of vital staining using pregnant rats. Although this appeared to be a ready solution to a difficult problem, it was found that the parent animal became deeply stained and that the placenta successfully filtered all of the excess dye and that not a particle of the stain could be found in the fetus. The placenta provides complete protection of the fetus from the diffusion of the dye.

Although it is usually stated that vital staining stains the bones, in our experiments (using trypan blue mostly, but also alizarin and litmus) the bone matrix did not take the dye, but the connective tissues of the periosteum and ligamentous structures were deeply stained. The blood vessels and Haversian canals could often be seen stained.

Fig. 5. Rat skull, adult, vital staining, showing suture line.

Leriche and Policard[2] in their recent book upon the physiology of bone, speak of a gelatinous liquid that occurs about the ends of fractured bones and that can be seen at about the fourth or fifth day after fracture. They refer to Gerdy who in 1855 described this material, which was spoken of by the older writers as "suc osseux" or bone juice.

Leriche and Policard have watched the transformation of this gelatinous material into a fibrillar network which later becomes impregnated with the salts of lime and produces bone.

This colloid material can be more readily studied in the vitally stained animal and can be seen before the fourth day. The neighboring structures are intensely stained while this bone juice remains colorless. This material can be differentiated from blood serum. The latter takes the color of the dye, whereas this bone juice remains colorless.

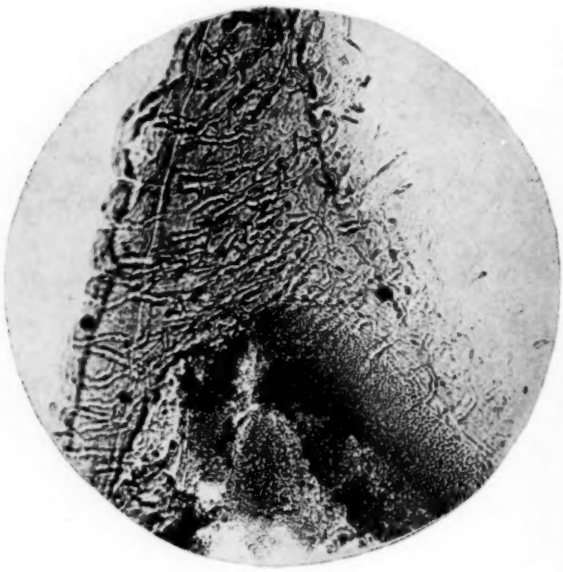

Fig. 6. Adult rat femur, cross section, vital stain. Marrow cavity and crest of femur, showing distribution of Haversian canals.

I believe that this gelatinous material represents an early form of pre-osseous material and provides the framework for the structure that is destined to become callus and later bone.

The origin of this material is purely conjectural, but it is likely to be a product of the organic bone matrix, for if it came from any other source, it would be likely to carry with it the color of the dye.

A tremendous amount of labor has been spent upon the problem of the ossification of the pre-osseous substance. In early fetal life the mesenchymatous structure, by a process of condensation, undergoes a differentiation into transitory cartilage. Further condensation occurs, and nuclei appear.

This embryonic cellular cartilage is composed of large, vesicular, polyhedral or irregularly rounded cells, among which is found a small amount of chondromucoid ground substance which surrounds the cells.

This chondromucoid intercellular substance forms more or less complete septa and represents the embryonal matrix into which the bony material will eventually be laid.

A further differentiation, apparently unaided by the cellular structure, occurs in this matrix producing a hyaline appearance, giving each cell the appearance of being surrounded by a distinct cell membrane.

Fig. 7. Femur, one week-old guinea-pig, vital stain; incomplete ossification; open Haversian canals; bone cells in pre-osseous tissue.

The careful study by Carey[3] of the minute consecutive changes in the early stages of the development of bone leads him to the following conclusions: "It is clearly demonstrated that degeneration of the parenchymatous cartilage cells and calcification of the intercellular cartilaginous matrix are not processes intrinsic to the cells involved, as one is led to believe by reviewing the literature of these changes in early primary bone development, but are the natural resultants of the differentiation of the fibroblastic perichondrium."

Here again, therefore, from an embryological standpoint we have a very definite statement that the calcification of bone is not the product of the activity of the cells of bone, but is a further differentiation of the organic matrix of bone.

From the purely inorganic chemical angle all research into the problem of bone production has signally failed.

From this chemical angle Watts[4] has made a series of microscopic investigations of the action of the two salts in aqueous and colloid solutions. His experiments would warrant no conclusion applicable to the matrix except, perhaps, the negative one, that calcification is not the result of direct precipitation.

Fig. 8. Rat femur three days old. Incomplete ossification of trabeculae.

On the other hand, the illuminating experiments of Shipley, Kramer and Howland[5] demonstrate the avidity of the decalcified matrix for the salts of bone. They placed pieces of cartilage and bone of rachitic rats in normal rat serum and calcification occurred. The calcium phosphate is deposited in the intercellular matrix and never in the cytoplasm of the cells themselves, just as is the case when healing occurs in vivo.

Shipley found, furthermore, that, calcification does not begin on the surface of

the slice of tissue as one might expect *a priori*, but the first deposits of lime salts are in the depths of the cartilage and the process gradually extends to the surface.

Numerous attempts have been made to produce calcification in pieces of dead cartilage, but these experiments fail to show calcification.

In summarizing, these authors conclude: "It is impossible to advance any theory to explain the selective deposit of the calcium salts. The process is clearly not one of simple precipitation. It depends upon the activity of living tissue."

From this survey of the pre-osseous material and of the process of ossification, it seems demonstrated that the vital substance of bone structure is the collagenous intercellular material, and that the aberrations of bone, as presented in its pathologic states, must find their chief cause in this substance.

What theory, then, can be offered in the place of the one hitherto held?

It must be understood at the outset that any theory of the physiology of bone must account not only for normal bone production but also, through aberrations of this normal physiology, for the manifestations presented in disease, including processes reactive to bacterial or other invasion, and tumors of bone.

In other words, the test of accuracy of any theory, is its flexibility to accommodate its application to all conditions that may properly fall within its scope.

If we will accept, therefore, as a first premise, as stated above, that the vital substance of bone structure is the collagenous intercellular material, the problem at once falls within the domain of the chemistry of the colloids.

A fact not mentioned before is the avascularity of the pre-osseous tissue. This substance is devoid of blood vessels to such a degree that it forces the inference that the salts of lime, namely calcium phosphate and calcium carbonate, already in the proper ratio, must be an inherent part of the collagenous matrix.

If we will concede that the intercellular substance of bone consists of such a colloid body which contains in its substance the specific elements of bone, it becomes easy to conceive how by biological activity, which I have elsewhere spoken of as "calcium coagulation," bone formation might readily be established.

This conception does not involve any new or unknown action of colloid matter but is entirely parallel with the action of certain colloid substances both inside and outside of the living organism. Examples of such biological colloid mutations occur, for instance, in the development of the teeth, the exoskeletons of various animals and, probably, in the formation of gallstones and other concretions.

The property of reversibility which is peculiar to colloids would amply explain the destructive processes of bone absorption and osteolysis.

This conception would, therefore, give the place of first importance to the collagenous intercellular matrix, and regard it as a tissue that retains its vitality and holds in a reversible colloidal state the inorganic salts of bone. Any influence, be it chemical, bacterial, vascular, nervous or glandular, would exert its effect upon this substance, which in turn, would be reflected in a corresponding alteration in the calcified content.

An explanation of the pathology of bone, however, rests not merely upon an explanation of the mobilization of the calcium content, but also upon the mutations of the organic matrix, released from its calcium salts.

The decalcified matrix, in view of its closely related functions and derivations from a common ancestral mesenchyme, might be converted into or replaced by any form of connective tissue or cartilage, might degenerate into cysts or might undergo malignant change.

This facility for changing the type of specialization is sometimes referred to as "plasticity" and is especially pronounced in tissues of the connective tissue type.

A mechanism such as the one described, would give us, I believe, an explanation for all the various phenomena presented in the pathologic states of bone.

To be more specific, how, then, may this theory be applied to some of the common lesions of bone?

In osteitis fibrosa cystica, the fibrotic change is paramount. The bony trabeculae lose their calcium content. Decalcification and calcification are simultaneous processes. Areas of complete decalcification are seen; in these regions the organic matrix appears to have undergone metaplastic changes and healthy young connective tissue may be seen, or areas of new cartilage formation.

The fibrosis may extend throughout the marrow cavity. Decalcification of the cortical bone occurs with fibrous replacement involving the entire structure leaving only a shell of lamellar bone, covered by periosteum.

Along with this fibrotic change is a strong tendency to the formation of cysts. The formation of cysts is most probably the result of regressive changes of fibrous tissue, which completes its cycle in the stage of liquefaction. Whether these cysts are primary or part of a more complex bone lesion, their mechanism is probably the same.

The mechanism of the production of osteomyelitis affords a striking example of this theory. Contrary to other lesion in which the decalcified matrix undergoes metaplastic changes, in osteomyelitis, owing to bacterial invasion or circulatory disturbances, the organic matrix itself undergoes devitalization and death. There follows, in consequence, an inhibition of further biological influences upon the calcified colloid, resulting in a mass of dead, inert calcific material, destined to become sequestrum and dependent upon molecular disintegration for its removal.

The relationship between new bone formation and the organic matrix of bone in osteogenic sarcoma, has been discussed by me in a previous publication.[6]

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Discussion

Dr. Max A. Goldzieher (by invitation): It is a very important point in the preceding paper that growth of bone tissue or destruction of bone is not a product of osteoblast or osteoclast activity, respectively. For many years pathology was and still is hampered by the conception of absolute tissue and cell specificity. The basic truth of the statement that every cell derives from another cell of similar character is of course still to be maintained, particularly in the teaching of pathology to medical students, but the exceptions from this rule are many and should not be overlooked. It is a fact that bone tissue and cartilage are usually formed in the fetus and later in life from a bone or cartilage matrix, or from the specific periosteal and perichondrial tissue. On the other hand, it cannot be denied that both cartilage and bone can be formed quite independently as, for instance, in obsolete tuberculous foci in the lungs. Bone formations in such foci contain all the features of real bone tissue and often include channels filled with regular bone marrow. Similar observations in general pathology indicate that the formation of bone is not a specific property of specific cells or "osteoblasts." It rather seems that connective tissue cells of any kind may produce bone as a result of some, as yet unknown, stimulation.

The question comes up whether the matrix of the bone tissue, which of course is not the product of the so-called osteoblasts, is an independent living substance as described in Dr. Eising's paper, or whether it should be regarded as an intercellular material dependent on some cells as to both nutrition and function. The

conception of an independent acellular matrix is certainly new and striking, but it is questionable that there is enough evidence to maintain such a point which is in contradiction to our general knowledge of live protoplasm. I would rather feel inclined to believe that the bone matrix is the product of some cells and still remains under the influence of these cells so far as nutrition and function are concerned, similarly to the behavior of the collagenous connective tissue fibrils.

Of utmost importance in Dr. Eising's paper is the emphasis laid upon the colloidal chemical aspects of bone pathology, particularly so far as calcification and decalcification are concerned. It seems to me that the conception of decalcification on the basis of simple colloidal chemical processes such as occur in vitro, can be well maintained. On the other hand, I don't feel confident that the process of calcification will be ever repeated in vitro experiments, as calcification of bone seems to be dependent on the action of living cells. I am purposely differentiating here between the diffuse calcification of bone tissue as a vital process and the precipitation of coarse granules of lime in and about necrotic tissues or exudates. In studying the formation of bone and the processes of calcification and decalcification, respectively, by far the best material available is that of bones with osteomalacia or rickets. In such conditions, even better than in embryological specimens, it can be demonstrated that calcium content and formation of bone matrix are two totally different processes, although physiologically constantly combined. While in both pathological conditions there is a resorption of bone tissue including both the calcium and the matrix, there is simultaneously formation of matrix without calcium surrounding the bone trabeculae as a limeless seam. It has been definitely shown that these osteoid seams are not due to decalcification, but to deposit of straight limeless osteoid. If the pathological process tends toward healing, the ostoid tissue, which is often quite bulky, reveals intense calcification. There is absolutely no evidence to show that secondary calcification of osteoid has anything to do with the activity of osteoblasts and there is no better explanation for this process than that of some colloid chemical changes in the osteoid which, however, cannot be demonstrated but in live bone tissue. It seems, therefore, that such calcification of osteoid tissue is dependent on the vital function of cell elements within the bone matrix.

TONSILLECTOMY BY ELECTROCOAGULATION*

PHILIP H. GREELEY, M.D.

PORTSMOUTH, N. H.

IN the process of destruction of tonsillar tissue by electrocoagulation the equipment is no small factor. I am not qualified nor do I wish to discuss the various high frequency machines except to say that it is necessary to have a machine that will deliver a current of low voltage and high amperage and will not produce any sensation except heat. One should have a good head light and place the patient at a convenient distance from the machine.

The current is tested to register just under 1500 ma. If the patient is unable to control the throat when the tongue depressor is used a 5 per cent solution of cocain in a 50 per cent solution of adrenalin is brushed over the base of the tongue. Sometimes a second application is necessary. No other anesthetic is used. The patient holds a metal rod connected to one pole and the operator uses an applicator with a small metal point insulated to within one-third inch of the end which is attached to the other pole of the machine. This point is brought in contact with the tonsil. Begin at the center of the lymphoid tissue and do not get very near the edges until the patient has gotten used to the method and over his fear. After he finds that he is not going to be hurt, a little disagreeable sensation caused by getting against the pillars will be overlooked and almost unnoticed. The current is switched on with the foot and each individual contact is continued long enough to produce distinct blanching. Then the foot is removed from the switch and the metal point is moved to another place.

The amount done at each sitting depends on the size of the tonsil and on the patient. The first treatment should usually be short, because the patient is usually a little frightened and under some nervous strain. Many times I do only enough to let him see what it is like. There is rarely any trouble in doing as much as you think necessary after the first treatment. Each individual sitting requires a very short time so there is no reason to be in a hurry.

The thing that I regard as most important is not to use so much current as to coagulate too deeply. That, I think, is the cause of hemorrhage when the slough comes off. I have had one patient who bled because, I am sure, too much was done at a time with too strong a current.

Treatment can be repeated in about ten days as that is about the time for the coagulated tissue to separate. The number of treatments varies with the size of the tonsil and its consistency. The soft, mushy tonsil will disappear much faster than the hard fibrous type. It is obvious that this method is adapted to the small tonsil and to the adult tonsil that is not only small but irregular and hard to get at by the usual method also to the patient who is a poor surgical risk. By electrocoagulation there need be no portion left behind which so often happens in the surgical procedure.

I have used fulguration to destroy tonsils but have found electrocoagulation more rapid and less painful, and with it I have had less difficulty in getting the last bit of tonsil. My experience tells me that if the tuberculous patient is relieved of his infected tonsils his recovery will be made less difficult. Electrocoagulation stirs up no infection in the throat and it can be used safely even when the tonsil is acutely inflamed. In fact, it seems to be of value to

*Read before the New England Association for Physical Therapeutics, May 18, 1927.

the remaining uncoagulated tonsil by its sterilizing effect. One does not have to wait for his patient to improve in health before this method is begun.

Just a word regarding tonsils themselves. Do not forget that they are all diseased. If you find small innocent pale tonsils and you tell your patient that his tonsils are all right and should be let alone you are in danger of doing him a great injustice. This sort of tonsil has no drainage except into the blood stream and can thus be compared to the innocent looking tooth with an abscess at the apex, while the rotten-looking tonsil, with open crypts discharging pus into the throat may be compared to the tooth with pus discharging around it. In the first case toxins are being absorbed, in the latter they are going into the mouth and stomach. In the work of detoxication for the cure of disease we must not forget that in order to succeed all infected areas must be removed.

Briefly, the advantages of electrocoagulation are these: The patient does not have to take an anesthetic, is not made ill, can go about his tasks, and can eat and enjoy life as usual; no matter how badly infected the tonsil or how acute the inflammation, treatment may be started. Instead of stirring up the infection and increasing the toxic absorption electrocoagulation or surgical diathermy actually destroys the infection in the part of the tonsil not coagulated, so it often happens that the tonsil takes on a healthy appearance before it is completely destroyed. By this method the tonsil may be removed completely and by having the patient come to the office after a year it is easy to keep the throat free of lymphoid tissue if any should develop.

[SURGICAL SUGGESTIONS]

TWO important principles apply in the surgery of *chronic* osteomyelitis: First, the bone itself should not be attacked until a sequestrum has definitely formed. Second, the simple removal of sequestra may be all that is necessary to effect healing, in spite of overhanging healthy bone. As a rule, simple sequestrectomy should serve as a primary operation. The shallow bone trough may be required to effect definitive healing, but plastic osteotomy may be wisely deferred until its necessity and extent are definitely indicated.

BILATERAL COMPLETE CERVICAL FISTULAE

WARREN WOODEN, M.D., AND DON K. HUTCHENS, M.D.

ROCHESTER, N. Y.

REPORTED first by Huncyowski in 1789, differentiated from midline fistulae by Acherson in 1832, placed on an embryological basis of branchial cleft origin by Hensing in 1864 and convincingly attributed to thymic origin by Wenglowski[13] in 1912, an extensive bibliography of lateral fistulae of the neck has developed, with but scant reference to complete fistulae on both sides. A case reported by J. D. Whitham,[14] during 1926, which exactly corresponds to the one here described, and a case mentioned without details by C. Eggers[6] in discussion of a paper by Willy Meyer,[12] seem to constitute all available references to this phase of the subject.

FIG. 1. Before operation. Note pit of first bronchial cleft.

FIG. 2. One year after operation.

Accepting the embryological studies of Wenglowski, recently reviewed by Christopher, it seems inevitable that these fistulae must be classified as of thymic origin, first, because they correspond in location to the tract left by developmental descent of the thymus; second, because the branchial apparatus cannot leave remnants in the neck below the hyoid bone; and, third, because this hypothesis furnishes an exact analogy to the tract left by the embryological progress of the thyroid.

The anatomical relations of the complete fistulae are subject to some variation, but the findings are usually constant: they extend from the skin surface, anterior to the sternomastoid muscle, to the hyoid region, under the digastric muscle, through the bifurcation of the carotid artery, under the styloglossus and stylopharyngeus muscles, over the glossopharyngeal and hypoglossal nerves and into the lateral wall of the pharynx in the region of the posterior pillar of the tonsil.

The surgical extirpation by radical dissection with addition of inversion of the pharyngeal terminus as devised by von Hacker should fulfil operative requirements. To lessen the difficulties of a rather formidable dissection, it may be remarked that the tract, injected with solution of gentian violet is indicated adequately because of its transparency, that colonic anesthesia gives superior operative convenience, and that in event of failure to locate the internal opening at the final stage of the operation, a passage of the ligated terminal portion through a deliberately made opening, presumably near the natural one, may be expected to effect a cure.

CASE REPORT

Case No. 32701, Rochester General Hospital.

A boy, aged seven years, was brought to the Out-Patient Department because of a constantly "dirty neck." Since birth the typical lateral openings had discharged thin material, especially at meal time, and had necessitated the wearing of dressings. A period of blocking and cyst formation had never been experienced. A probe could be passed into each sinus about 3 cm., mastication of a methylene blue tablet brought prompt appearance of the color externally, and an injection of bismuth in olive oil permitted a fair outlining of the tract by roentgenogram. There was nothing of importance in the physical examination or family history.

On November 18, 1925, complete extirpation was done on the right side under colonic ether anesthesia. The above-mentioned anatomical relations were defined and the tract was dissected free with some difficulty to within 1 cm. of the pharyngeal entrance. After prolonged and vain search for the inner opening the ligated end was forced through the pharyngeal mucosa at a point presumed to be near the natural opening, and sutured to the posterior pillar. An uneventful recovery was made, leaving a satisfactory scar externally and no trace internally.

After a period of delay due to a series of routine throat cultures exhibiting Klebs-Loeffler bacilli, an identical procedure was carried out successfully on the left side on January 20, 1926.

On follow-up visit one year and a half later, this case exhibits a very satisfactory cosmetic and anatomical cure (Fig. 2).

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INTERSTITIAL ECTOPIC GESTATION, OPERATION, RECOVERY: A CASE REPORT

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WE report this rare case without reviewing the literature, which is not accessible to us in this small town. In interstitial pregnancy the ovum is arrested in that portion of the tube that is within the uterine wall. Polak says,[1] "Pregnancy in the interstitial portion of the tube may terminate:

"(1) By death of the ovum.

"(2) By expulsion of the ovum into the uterus, in which case the pregnancy may terminate as an abortion or proceed and develop as an intrauterine pregnancy.

"(3) *By rupture into the peritoneal cavity with death of the mother from hemorrhage and shock. The woman but rarely survives interstitial rupture.*

"(4) The ovum may rupture into the broad ligament, etc."

The ovum developing within the walls of the uterus, though outside the uterine cavity, rupture of the sac ordinarily occurs much later in this type of extrauterine gestation than in the more common forms, and the difficulties of diagnosis are much greater because of the closer resemblance of the condition to normal pregnancy. Bland[2] says, "A gestation developing in the uterine or cornual section of the Fallopian tube occasionally occurs and is infinitely the most serious type of ectopic pregnancy," and "Interstitial pregnancy forms the most dangerous, as well as the most fatal type of the condition."

CASE REPORT

Our patient, white, aged 23 years, has two normal children by a previous marriage. Her present marriage was less than a year before her present illness. Previous labors were normal except that three years ago she had a rather difficult labor which terminated spontaneously. No previous history of abdominal trouble. Nothing significant in her family history.

The patient was rather doubtful that she was pregnant. Her last menstruation was March 15, 1927. Her disability developed with vomiting, following a severe follicular tonsillitis. She complained of an occasional slight pain throughout her abdomen one week before operation, but she failed to localize it and thought very little of it.

On April 6, 1927, at 8:30 P. M. she suffered a very severe pain in the abdomen, at first most pronounced on the right side, but later general in character. She failed to receive any relief from this pain. It was spasmodic, lasting from five to fifteen minutes, with free intervals.

She was first examined at 10:00 P. M. that night when she was in severe pain. Her expression was not pronouncedly changed. Her abdomen was very tender all over, but especially over McBurney's point. The pain was increased by deep respiration and by any movement. She was very rigid over the entire abdomen, especially in the right iliac region. Palpation anywhere over the abdomen elicited pain which was referred to McBurney's point. Pulse was 74, temperature 98°. The chest was negative. The uterus was found enlarged to the size of a two or three months pregnancy, therefore, larger, than was to be expected from the history. The cervix was rather firm and long, with no discharge of any character. Palpation of the adnexa impossible because of the tenderness.

The patient was taken to St. Joseph Sanitarium at Del Norte at midnight, and on admission was reexamined. The tenderness and rigidity were less marked over the left side but were pronounced over the appendiceal region. Every deep breath evoked a spasm of pain, which now became definitely localized in the lower right abdomen. The facies were normal.

At 4:00 A. M. the patient showed signs of a moderately severe anemia and became anxious. Diagnosis was then made of a surgical abdomen due perhaps to a fulminating suppurative appendicitis or ruptured ectopic pregnancy.

[1] Polak. J. O., Manual of Obstetrics. Ed. 2., N. Y., 1922, p. 265.

[2] Bland, P. B. Gynecology, Medical & Surgical. Phila., 1926, ii, 826.

On April 7, at 5:30 A. M. operation under ether anesthesia. A low right rectus incision was made by one of us (Gjellum). On opening the peritoneal cavity there was an enormous gush of fresh blood and many large and small clots. An intact fetus of from ten to twelve weeks was delivered with the unbroken sac through the abdominal incision. It was lying free in the abdominal cavity.

Palpation of the uterus showed a large rent two or three inches in diameter on the superior half of the musculature at the tubo-uterine junction. The free tube was normal and uninterrupted in its continuity. The rest of the uterus was also normal. The tear did not go through so as to communicate with the uterine cavity. Its base was in the musculature of the superior horn. The rent was repaired by catgut, the sutures beginning from the bottom of the cavity and being placed in layers upward. The whole was covered with peritoneum.

The peritoneal cavity was cleansed of all clots and free blood. A small cigarette drain was left in it. The entire procedure lasted 80 minutes. During the operation hypodermatoclysis and intravenous saline infusion with digalen, 15 minims, and adrenaline chloride solution (1:1000) were administered.

The patient made an uneventful recovery and was discharged cured in two weeks.

[SURGICAL SUGGESTIONS]

IN chronic osteomyelitis, to chisel away healthy or more or less necrotic bone before there is a complete sequestration is not a good practice, though a common one; it is an operation in which, in the nature of things, one does too much or too little. Every chisel stroke, every scrape of the curette is an invitation to fresh sequestrum formation; and the extensive osteotomy often serves to delay rather than to hasten the cure.

STAPHYLOCOCCUS aureus, the common invader of bone, and streptococci may lie dormant in the osseous tissue for many years after the storm of the acute osteomyelitis has passed and then, reactivated, may produce a more or less violent recrudescence of the disease or, more commonly, may reveal their presence by some milder process of suppuration or necrosis.

TRANSACTIONS OF THE
SECTION OF SURGERY
NEW YORK ACADEMY OF MEDICINE

Meeting of May 6, 1927

DR. EDWARD C. BRENNER, PRESIDING

PERFORATED ULCERS OF THE DUODENUM

A REPORT BASED UPON 27 CASES

EDWARD C. BRENNER, M.D., F.A.C.S.

(Abstract)

IN this most dramatic of acute abdominal crises, operation within the first twelve hours with simple closure of the perforation will terminate in recovery in the vast majority of cases. The question is whether such ulcers are cured by simple inversion closure and the patients remain well and asymptomatic.

The normal motility mechanism is badly deranged by gastroenterostomy. Normally the acid chyme when it flows into the duodenum transforms the prosecretin into secretin and thus establishes pancreatic secretion. The churning movement of the duodenum intimately mixes the chymified food with the bile and pancreatic ferments and then passes it into the jejunum. Gastroenterostomized patients are subject to a change that may be termed revolutionary insofar as the physiology of their digestion is concerned. Gastric contents that are improperly prepared enter the jejunum which in consequence must do the work of the duodenum, a part of the process of digestion for which it has no physiologic fitness. The subjective and objective sequences of this digestive dysfunction may be pain, vomiting, diarrhea—in fact the whole gamut of dyspeptic signs and symptoms. That many of these patients thrive despite this handicap only shows the adaptability of the human economy.

It is nevertheless true that gastroenterostomy performed for the purpose of relieving scar tissue obstructing the pyloroduodenal orifice is, in the majority of cases, an entirely satisfactory procedure. In such cases of obstruction there has existed for some time an altered function, both motile and secretory, mostly of the stomach, to a less degree of the duodenum. For that reason, one chooses the lesser of two evils and makes a short-circuit, trusting to nature's well-known tendency to establish a satisfactory balance.

Conversely, it is well known that in the absence of true pyloroduodenal stenosis, gastrojejunostomy is often fraught with disaster; for several months the patient is likely to be comparatively free from symptoms but later results may be most disappointing.

The cardinal indication therefore, for gastrojejunostomy would be actual or organic stenosis.

This form of stenosis did not obtain in the majority of the 27 cases and the impression would seem to prevail that in relatively few perforations from duodenal ulcer does real stenosis occur.

Moreover it must be remembered that nature overcomes many apparent stenoses. This fact is well demonstrated in 3 cases, which were subsequently operated on for other conditions.

The duodenum in all three cases was restored to normal yet apparent stenoses presented at the time of perforation, and in one case it was so pronounced that a primary gastrojejunostomy was added.

PATHOLOGY

The true surgical ulcers present five general types:

1. The large ulcer with much scar tissue formation encroaching upon the lumen of the duodenum and accompanied with more or less extensive extrinsic adhesions.

2. The medium-sized ulcer with moderate scar tissue infiltration, without narrowing of the lumen.

3. The small ulcer with a non-indurated or only slightly indurated base.

4. The acute necrotic ulcer.

5. Multiple ulcers, including the so-called "kissing" type.

Clinically most acute duodenal perforations are those of Types 2, 3 and 4. There is a remarkable monotony of appearance in these lesions. They are simple, single, round, slightly indurated, 1 cm. to 2 cm. in diameter, on the suprapapillary part of the duodenum (the proportion is 450 to 1) and nearly always in the first 1½ inches of the anterior or superior surface. Those occurring at the junction of the pylorus and duodenum are probably for the most part duodenal. In these the pyloric veins are often obliterated. Much less than half of these ulcers present adhesions to neighboring structures, the gall bladder, liver, colon, stomach and omentum. It is my opinion that most ulcers that perforate suddenly are non-adherent to adjacent viscera, and when adhesions are present they are almost invariably of recent origin. Disease of the appendix and gall bladder is a frequent concomitant.

The perforation is usually 2 mm. to 5 mm. in diameter, a typically punched-out hole in the crater of the ulcer. If carefully examined it will be noted that the entire ulcerating portion is extruded as the result of embolism or thrombosis. The remaining peripheral induration is the protective zone that accounts for the rapid healing of the lesion after closure. I believe that in many cases this induration is soon absorbed and the duodenum is restored to its normal condition without any macroscopic evidence of previous disease. Thus one seems justified in stating that lesions of types 2, 3 and 4 which form the majority of duodenal perforations are best treated by simple closure.

The large ulcer with an abundance of scar tissue induration which encroaches upon the lumen of the duodenum and which usually is adherent to neighboring organs, presents a different pathology and demands appropriate surgical therapy. Such lesions, prior to perforation, have produced a partial stenosis thereby resulting in a change in the motile and secretory functions of the stomach. The closure of these ulcers after perforation usually produces a real rather than an apparent obstruction. Consequently they present the cardinal indications for gastroenterostomy, namely, stenosis plus a preexisting altered gastric function. (Perhaps some form of pyloroplasty of the Finney or Horsley type may prove efficacious in the therapy of these types.) Furthermore, simple closure in this type seldom results in permanent cure, and the relapses after such a closure have helped to popularize primary gastroenterostomy for all types. The treatment of the multiple ulcer type must be governed by the pathological problem at hand.

From the above-mentioned pathology, it will be noted that for practical purposes perforated ulcers of the duodenum conform themselves to one of two types. First, the soft lesions, the more common type, characterized by (a) their relatively smaller size, (b) their superficial extent, (c) their failure to penetrate deeply prior to the embolic or thrombotic phenomenon which results in perforation, (d) the absence of dense induration, and (e) lack of adhesions and encroachment upon neighboring structures. Second, the calloused type, characterized by (a) their large size, (b) their deep penetration, (c) their dense induration, (d) their firm adhesions to neighboring structures, and (e) their tendency to produce mechanical complications. I believe that simple closure by inversion with fine chromicized catgut will cure the vast majority of the first group, whereas the calloused types require in addition a primary gastroenterostomy (or perhaps some form of pyloroplasty). The successes and failures in this series are in accord with these general principles.

DIAGNOSIS

The diagnosis of perforation can be made easily in almost all cases. The anamnesis of previous indigestion, the suddenness of onset, the agonizing pain (constant in character in contradistinction to the colic-like pain of appendicitis, cholecystitis, intestinal obstruction or renal colic), the vast extent and the degree of rigidity and tenderness so soon after onset, the comparatively slow pulse, and the slight or no febrile reaction make a familiar picture. A few points are worthy of emphasis. Vomiting occurred in less than half of the cases in this series (12 cases). Rectal examination may elicit extreme tenderness soon after perforation, much earlier than in appendicitis. The symptom of shock has been overemphasized; in this series but 7 cases were in any degree of shock. Apparently shock, when present, occurs soon after perforation, and is transitory. It should also be mentioned that in stout individuals there is only moderate rigidity. Also in the transitional period passing on to true peritonitis, there is a free interval when the pain is ameliorated. One patient (case 3) seen eighteen hours after perforation sat up in bed exclaiming he felt quite well. No opiate had been administered. His abdominal cavity contained the usual amount of duodenal contents and the peritoneum was markedly injected. More than half the cases show obliteration of liver dullness, either partial or complete. It is merely a corroborative sign and is in no wise pathognomonic. The left shoulder pain, mentioned as occasionally occurring early after perforation, is probably a pneumogastric-spinal accessory reflex rather than pain of peritoneal or anginal origin.

In the preperforative irritation stage, physical examination may reveal acute tenderness over the ulcer with some rigidity of the overlying muscles. This connotes a deep ulcer with peritoneal irritation and should be an indication for surgical intervention. (Case 7 well illustrates this danger signal: The patient, a female aged fifty-seven years, for six months had typical hunger pains occurring three hours after eating. Her examination elicitied acute tenderness over the site of the pylorus and moderate rigidity of the rectus. Temperature, pulse and blood count were normal. She was put to bed and placed upon the Lenhartz diet. Tenderness and muscle spasm persisted. On the eleventh day of treatment, perforation occurred suddenly while she was at absolute rest.)

TREATMENT OF ACUTE PERFORATIONS

The treatment of acute perforation is immediate operation regardless of any degree of shock that may be present—for the patient's condition rapidly improves with the relief of intraperitoneal tension. A 4 inch right mid-rectus incision is deepened down to the peritoneum. A point of practical importance is to determine the lower border of the liver. This should limit the upper angle of the incision. If a small nick be first made into the peritoneum a little free fluid will well up into the incision, and gas bubbles erupting through this will clinch the diagnosis of perforation. The escaped contents are best aspirated, especial attention being paid to Morrison's space, to the right lumbar gutter, and to the toilet of the pelvis. With moist pads the surrounding structures are gently pushed aside and the perforation is sought. Fibrin deposits are an excellent guide to the point of perforation and not infrequently gas bubbles point the way. If the perforation is obscure, slight pressure on the stomach may cause bubbles to appear. Closure of the perforation is accomplished by infolding the ulcer with fine chromicized catgut reinforced occasionally with an omental tab. The expediency of a primary gastrojejunostomy is determined by the conditions presenting. If simple closure is performed, one tests the patency of the lumen of the gut. If the tip of the little finger can be insinuated through the site of closure, there is little danger of obstruction. One then makes a search for secondary ulcers, gall-bladder and appendiceal disease.

The added risk of primary gastroenterostomy, before the advent of peritonitis, is slight in a patient whose condition during operation, as regards respiration, aeration and circulation, is good. The danger of working in a potentially infectious field is more theoretical than real. The real dangers are twofold: (1) a 2 to 3 per cent chance of future gastrojejunal ulcer formation and (2) the late secondary sequelae that occur in some cases despite perfect technique in the hands of the most skillful. Therefore, unless the condition is such as to demand a primary gastroenterostomy, viz., definite obstruction, simple closure should be performed. A good practical rule is, when in doubt, do not perform a gastroenterostomy. It can be performed later, if necessary.

If a careful peritoneal toilet be made by aspiration there is no need of drainage except of the abdominal wall. The suprapubic stab wound seldom drains, but may produce adhesions and it is contraindicated. Drainage to the site of closure is never instituted as several duodenal fistulae have resulted thereby. The slow perforations with abscess formation are best treated by simple incision and drainage. If a fistula ensues, a secondary closure with gastroenterostomy is indicated.

Following operation the patient is placed in a semi-recumbent position, given one or two doses of morphine and a 5 per cent glucose rectal drip. Small amounts of water by mouth are permitted after four hours. On the third day, Lenhartz's diet is instituted and adhered to for its entire course. At this time, the foot of the bed is kept elevated about 6 inches. Frequently small amounts of alkalies are administered the first two weeks. The patient is then given a light, selected, nonbulky diet with crackers and milk between meals for the next two weeks. At the end of the month a roentgenologic examination is made. The patient is warned of the dangers of dietary indiscretions and receives medical supervision for at least six months.

REPORT OF TWENTY-SEVEN CASES

This series is of consecutive cases operated upon between October, 1912 and October, 1926. There were 25 males and 2 females; the youngest patient was aged twenty-one years, the oldest fifty-seven years; the average age was thirty-five years. It is interesting to note that no patient was obese (contrast the gall-bladder type) and that several had been under rather severe mental or physical strain for some period of time. Their occupations were varied, no one predominating.

Seventeen patients, 63 per cent, gave a typical previous ulcer history varying from a few months to eleven years. Eight, 30 per cent, presented an indefinite history of dyspepsia. In 2 cases there were no symptoms up to the moment of perforation. (In these the evidences of inflammation and repair were absent and the picture was one of focal necrosis.)

But 2 cases gave a history of melena, none of hematemesis. In only 3 cases perforation occurred within the first year of symptoms and the average duration of symptoms until perforation was almost four years.

Of the 27 perforations, 24 were acute and 3 slow perforations. Of the slow perforations one presented a large abscess extending from the liver to the iliac crest. This was of two weeks' duration. Another case slowly perforated, the infection apparently remained localized for a week and then ruptured, producing a diffuse peritonitis. In the third case the rupture was into the lesser sac presenting the clinical picture of duct obstruction with jaundice.

In conclusion one seems justified in emphasizing the importance of reporting the end-results of the treatment of perforated ulcers of the stomach and of the duodenum as separate entitites. The immediate results depend chiefly upon the time that has elapsed after perforation. Only by careful follow-up records extending over long periods can reliable statistics be obtained as to ultimate cures. Undoubtedly the duodenum is capable of complete restitution to normal even though apparent or mild degree of real stenosis obtains after closure. The end-results of

simple closure in this series are much superior to those treated in which gastrojejunostomy was performed. A fuller appreciation of the pathological problem presented in each case should result in more rational methods of treatment. To state dogmatically that all cases treated by simple closure will result in permanent cure is as illogical as to insist upon a primary gastrojejunostomy as a universal procedure.

Discussion

Dr. John H. Garlock: Dr. Dineen has asked me to present the figures of the cases of perforated ulcer on the Second Surgical Division of the New York Hospital. These include a number of private patients of Dr. Pool, as well as the cases from his service.

The total number of cases is 110. There were 25 deaths, a mortality of 22 per cent. There were 66 cases in which operation was performed within six hours of the perforation. In this group, the mortality was 4 per cent. In the cases coming to the hospital 22 hours or more after perforation, the mortality was 85 per cent.

There were 10 cases of simple closure plus primary gastroenterostomy; 1 case of pyloroplasty; 99 cases of simple closure of the perforation. Nine cases subsequently required gastroenterostomy.

The follow-up shows the following: Of 85 patients discharged, 77 were followed. Of these, 61 were rated "good," which means freedom from symptoms and restoration to their former occupation. Sixteen were marked "poor." Of the 61 "good," 55 had simple closure (79 per cent); 5 had closure plus gastroenterostomy (7.2 per cent); 1 had pyloroplasty. Of the 16 marked "poor," 14 had simple closure. Of these, 9 had a secondary gastroenterostomy, and are now well. In addition to the 14 cases, 2 had simple suture with primary gastroenterostomy.

This series of cases represents a group cumulative since 1914.

Dr. Thomas H. Russell: Coming from Philadelphia, where I had been taught by Dr. Deaver, to New York, as I did some years ago, I naturally did gastroenterostomy in addition to suturing the perforation in perforated duodenal ulcer and the cases did well. The first Horsley operation that I did some years ago was in a case of a perforated duodenal ulcer. The man made an excellent recovery, but the following December, after having operated on him in February, he developed a subphrenic abscess which I drained through the old wound and he again made a splendid recovery. I have used the Horsley excision in several cases of perforated duodenal ulcer instead of doing a gastroenterostomy. I have not done gastroenterostomy in a perforated duodenal ulcer for many years.

Dr. Abraham O. Wilensky: Dr. Brenner's paper is an elaboration and confirmation of viewpoints which I expressed about five years ago and published in *Annals of Surgery*. In that conception acute perforations occur either as primary embolic phenomena, in which event they resemble appendix perforations; or as similar phenomena in the base of established ulcers. Sometimes during operation one can distinguish between the two but usually the pathology is obscure.

As regards treatment, the lesions in the first of these two varieties regularly undergo healing after simple closure and recovery is not followed by subsequent symptoms. Operations upon the patients in the second group are very frequently followed by the classical symptoms of ulcer; indeed, in many of these the postoperative symptoms are simple continuations of the preoperative ones. Under the circumstances it seems better to do a simple closure of the perforation during the emergency. One can always reopen the abdomen, should there be sufficient indication to do so, and then carry out the procedures which seem best at a time when conditions are not complicated by the dangers of an acute perforative lesion. If one follows the plan of doing maximum operations during the time of the acute emergency one will do unnecessary manipulations and undergo unnecessary risks in a large proportion of the cases.

GASTRIC SECRETION AFTER SUBTOTAL GASTRECTOMY*

EUGENE KLEIN, M.D.

(*Author's Abstract*)

Hydrochloric acid is one of the important factors in the production of peptic ulcers. The good results after partial gastrectomy

* From the Surgical Service of Dr. A. A. Berg, and from the Pathological Laboratory, Mount Sinai Hospital, New York.

have been ascribed to the production of an anacidity. Lewisohn has reported that 77 per cent of the cases show no free acid after partial gastrectomy. Others have had similar results. The thought naturally occurs that it would be of value to ascertain why the remaining 23 per cent were not rendered anacid. In addition some gastrojejunal ulcers have recently been reported after this operation. It would be interesting to discover whether these occurred in the group in which the acidity had persisted. To study these questions a more careful analysis of the acid conditions was made after every partial gastrectomy. In place of the Ewald test meal which had previously been used, fractional (Rehfuss) test meals were made over a period of three hours.

A consideration of the physiology of the stomach shows that the operation of partial gastrectomy removes only one of the phases of gastric secretion.

The primary or psychic phase is due to impulses that reach the stomach over the vagi and are initiated chiefly by the tasting and chewing of food. This response varies in different individuals and also in the same individual at different times. It is directly proportional to the amount of appetite.

The secondary phase follows on the contact of the gastric mucosa with certain food and chemical substances, the most important being the products of protein digestion. Since the primary phase which initiates gastric digestion lasts about two hours, sufficient acid and ferment are secreted to digest some of the food present and therefore furnish these protein products. The acid and peptic cells are located in the body and fundus of the stomach. There are none in the antrum. Nevertheless stimulation of the body and fundus by the presence of protein products *does not* cause gastric secretion. Similar stimulation of the antrum *does*. The site, therefore, for the secondary stimulus is the antrum. This is the part of the stomach removed in partial gastrectomy.

The intestinal phase of gastric secretion starts one to two hours after the entrance of food into the intestine. Its relative importance in man is not yet determined.

In addition to these there is the so-called continuous secretion. It is probable that the gastric glands are always active. But while in the majority of individuals the secretion, except following the above stimuli, is small, in others it may be very large. Although a continued secretion with a high acidity in a stomach that contains no food may be pathological, it is often found in apparently normal individuals. It may be that those with the so-called ulcer diathesis fall within this group, since this condition is very common in duodenal ulcer. The origin of this secretion is unknown. It may be due to an exaggerated vagus tone.

The amount of acid secreted in different people varies since the stimuli exerted by these different phases are not of the same potency for all. Normal individuals thus fall into hyposecretory, isosecretory and hypersecretory groups, the largest being the middle or isosecretory group.

Partial gastrectomy removes the antrum and hence the secondary phase. This is ordinarily the most important. It therefore reduces quantitatively the amount of acid secreted. The remainder is neutralized wholly or in part by the food, saliva, bile and pancreatic juice. Whether it will be completely neutralized depends on the potency of the other phases in the particular individual. If, for instance, there is a very high and prolonged continuous secretion due to a markedly exaggerated vagus tone, antrectomy will only reduce the acidity. But where these phases are not overactive, antrectomy will produce a hypoacidity or anacidity.

The table shows the maximum acidity in the Rehfuss test meals immediately after (recent), and six months after (old) partial gastrectomy. These are compared to preoperative findings. In the group of duodenal ulcers there is a moderate immediate and a marked late reduction. In the gastric ulcers there is a marked diminu-

tion in acidity both immediately and six months later. The same is true of the group of gastrojejunal ulcers, although the number of postoperative cases is still small. A high continuous secretion is common in duodenal ulcer. It is rare in gastric ulcer. It may be that this accounts for the higher acidity left in the duodenal group. The cause for the further reduction after six months cannot be given. Possibly this is due to a lowering of the vagus tone.

While partial gastrectomy apparently does not produce an anacidity in as large a percentage of cases as previously believed, it nevertheless accomplishes a far greater reduction than gastroenterostomy. Gastroenterostomy produces no quantitiative diminution of acid secretion. It must hope to neutralize all of the acid secreted from all of the phases and it rarely succeeds.

MAXIMUM FREE ACID AFTER PARTIAL GASTRECTOMY IN FRACTIONAL TEST MEALS

		Anacidity per cent	0–20 per cent	20–50 per cent	50+ per cent	Number of cases
Duodenal	Unoperated		4	36	60	50
	Recent	9	9	46	36	11
	Old	25	41	17	17	12
Gastric	Unoperated		28	60	12	50
	Recent	45	33	11	11	9
	Old	100				3
Gastrojejunal	Unoperated		11	67	22	9
	Recent	25	25	50		4
	Old	50		50		2

Recent refers to cases examined about three weeks after operation.
Old refers to cases examined about six months after operation.
Unoperated in the gastrojejunal group refers to cases examined before the partial gastrectomy.

That the amount of acid reduction actually achieved by partial gastrectomy is significant is shown by the few recurrences reported after the operation. Where gastrojejunal ulcers do follow, it is probably due to the fact that a sufficient lowering of acidity was not effected because of the reasons mentioned above. Whatever acid did remain was sufficient in combination with the other causative factors of ulcer to produce a recurrence.

Discussion

Dr. A. A. Berg: I think the work Dr. Klein has presented is of very great importance in relation to the whole subject of gastric and duodenal ulcer. We know very little about the physiology of gastric secretion. It has a tremendous bearing on what to do to cure gastric and duodenal ulcers. Dr. Klein has proven that there are three kinds of curves of gastric secretion: 1, a hyposecretion; 2, a normal curve; and 3, a hypersecretion. It is hard to understand the way in which these three curves are brought about, where the stimulation for gastric secretion comes from, what the connection with the vagus nerves is, what is the exciting factor, and to what point excitation is carried before gastric secretion begins. In spite of the intensive experimental work that has been done in connection with the physiology of gastric secretion we still are very far from determining what the various exciting factors of gastric secretion are, along what channels they act, and what their relation to gastric ulcer is. We do know, clinically, that where there is no acid there is no ulcer, in spite of statements that ulcers can form in an anacid medium. In all our cases, and we have had many, we have still to find a single instance in which ulcer has existed in stomach or duodenum without acidity. If we can make a stomach anacid, we can say that in such a stomach an ulcer will not form.

I was very much interested in the New York Hospital statistics that 65 per cent of perforated ulcers are cured after simple closure of the perforation. Following our cases since 1914 we find we have not been so fortunate as to the permanency of cure after simple closure or closure combined with gastroenterostomy. It all hangs on the acid factor; without that the infective factor plays a very small rôle. All our attempts have been to reduce or minimize the amount of acid after operation. How successful we have been can be judged only by our results. When we have made a patient hypoacid we have as yet to find a single recurrence. Our trouble has come when a patient is hyperacid.

Another factor Dr. Klein has brought out is the bearing of anacidity on pernicious anemia. We have heard from authoritative sources the dire consequences of anacidity in producing pernicious anemia. How true that is I do not know, but in our 500 cases we have still to see a single case of pernicious anemia following subtotal gastrectomy, with anacidity.

I cannot lay enough stress upon the value of this work of Dr. Klein's on acid secretion. I am sure that he will continue these investiga-

tions and hope that he will some time find the center of acid secretion. Perhaps it will be on the lesser curvature somewhere near the re-entrant angle of the stomach and that all the stimulus passes toward that acid center and is reflected to the glands. Eight years after subtotal gastrectomy the acid cells are still just as normal as in an unopened stomach. Should we be able to control this acid factor we will be able to do away with recurrent gastric and duodenal ulcers and gastroenterostomy will then be a thing of the past.

Dr. A. Lightstone: My investigations on dogs have shown that the acid cells are in the pylorus. A French investigator reports he has found acid cells in the pylorus. These facts, and the work of Dr. Klein, seem to bear out the contention that the secretion of the pylorus is acid and not alkaline as is stated in the text books.

PRESENTATION OF CASES

PERFORATED DUODENAL ULCER SIMULATING COMMON DUCT STONE

EDWARD C. BRENNER, M.D.

This patient was referred to me by Dr. Arthur F. Chace on April 29, 1926, with the diagnosis of calculus common duct obstruction.

She is fifty-nine years of age, and has had 5 children, the last twenty-three years ago.

The past history is immaterial except that for ten years she has been troubled with flatulency, mostly in the evenings.

Six weeks ago she had a sudden acute attack of epigastric pain, without radiation or vomiting, lasting one hour. Four weeks ago, a similar attack requiring morphine. For the past three weeks she has had daily attacks of epigastric and right upper quadrant colic, been nauseated but did not vomit. For two and a half weeks has become progressively more jaundiced.

Examination. Flabby and obese, and markedly jaundiced. Tenderness and indefinite sense of mass in right upper quadrant. No rigidity. Temperature 100° F., pulse 88. Respirations 20. White blood cells, 11,000, polymorphonuclears 77 per cent. Coagulation time seven minutes. Stools showed no digestion of fats.

Preoperative Diagnosis. Stone in common duct.

Operation at N. Y. Post-Graduate Hospital, May 1st. Gall bladder normal, liver moderately enlarged and congested. On passing finger into foramen of Winslow several ounces of creamy pus escaped from lesser sac. This was aspirated with sucker through the gastrohepatic omentum. An indurated ulcer about 2 cm. in diameter with a 4 mm. perforation in its crater presented on the posterointernal surface of the first portion of the duodenum. This was closed by inversion. The dilated common duct was surrounded by inflammatory material. The lesser sac was drained through the gastrohepatic omentum and a posterior gastrojejunostomy was performed. Convalescence uneventful. On the sixth day stools became normal in color and in about six weeks the jaundice entirely disappeared.

The points of interest in this case are:

1. The history and clinical picture simulating common duct stone.
2. The unusual site of the ulcer.
3. Abscess of the lesser sac causing complete biliary obstruction.
4. The problem of surgical procedure in such a case. It was felt that common duct drainage was not necessary because the obstruction was an inflammatory condition and with its subsidence duct patency would return.

(*No discussion*)

GASTROJEJUNOCOLIC FISTULA

EDWARD C. BRENNER, M.D.

On February 22, 1920, this patient was operated upon at Lincoln Hospital for perforated duodenal ulcer and cholelithiasis. His ulcer history extended over a period of about three years, the gall-bladder symptoms for about six months, during which time he had two very severe attacks of colic.

The findings at operation were: A contracted gall bladder containing a moderate number of small calculi, and an indurated ulcer, 2 cm. in diameter, on the superior surface of the first part of the duodenum. There was a small perforation in its crater, the escaping contents being small in amount and well localized under the liver.

Operation consisted of closure of ulcer by inversion, posterior gastrojejunostomy, cholecystectomy and appendectomy. One cigarette drain to Morrison's space. Convalescence uneventful. For four and one-half years the patient remained well except for constipation and flatulency.

In July, 1924, he was suddenly seized with acute epigastric pain which radiated to the left inguinal region, was nauseated and at once had a copious diarrheal movement which he stated contained much of the previously ingested lunch. Ever since he has had diarrheal movements, twenty to thirty minutes after eating and stools contain parts of the previous meal. Movements have been ten to twenty each day and patient has lost 44 pounds.

The preoperative diagnosis of gastrojejunocolic fistula was confirmed at operation which was performed at the N. Y. Post-Graduate Hospital on December 1, 1924.

Operative Findings. Moderate adhesions about scar. Duodenum appeared perfectly normal. At site of gastrojejunostomy a fistulous communication with the transverse colon, the opening being about 1 cm. The colon, stomach and jejunum were separated and the gastric and colonic atria closed. Due to the ragged condition of the jejunum three inches were resected and a side-to-side anastomosis performed with difficulty. Time of operation fifty-three minutes. Convalescence uneventful. Patient was reading a tabloid newspaper the next day. Discharged on the sixteenth day. Gained about 30 pounds the first month. He has remained well.

The points of interest in this case are:

1. Four and one-half year period before developing the fistula.
2. Absence of symptoms of marginal ulcer up to time of perforation.
3. Complete restitution to normal of a previously badly damaged and stenosed duodenum.

(No discussion)

PERFORATED DUODENAL ULCER. DEHISCENCE OF WOUND

J. WILLIAM HINTON, M.D.

H. R., admitted to Bellevue Hospital June 9, 1927; discharged July 28, 1927.

The patient had had frequent attacks of pain in the upper abdomen with vomiting, at least once every year for four years. The pain was worse with each attack. Last attack came on suddenly fifteen hours before admission with sharp pain in mid-epigastrium which doubled patient up and caused him to vomit dark red material several times.

Examination. Thin, emaciated, middle-aged male, very acutely ill. The abdomen showed general board-like rigidity. Tenderness—general, most marked in epigastrium.

Preoperative Diagnosis. Perforated duodenal ulcer.

Operation. Abdomen opened through upper right rectus—splitting incision. On opening peritoneum gas and free fluid escaped. Duodenum delivered. Perforation found about 0.5 cm. in diameter. The ulcer was excised by the Horsley technique. Wound sutured transversely with No. 1 chromicized catgut, one layer of sutures being used. Abdomen cleansed by suction and closed in layers without drainage, No. 2 plain catgut for the peritoneum; No. 2 chromicized catgut for muscles and fascia, silkworm-gut for retention sutures; and silk for the skin.

On the eighth day there was partial separation of the skin with serous fluid saturating the dressing. Patient apparently had separation of the wound. Was taken to operating room immediately.

Second Operation. Complete separation of the peritoneum was found, although the skin incision had separated only for approximately one-third of the wound. Peritoneal edges freed, sutured with No. 2 chromicized catgut; muscles sutured with No. 2 chromicized catgut; fascia with No. 2 chromicized catgut; silkworm-gut retention sutures; skin not sutured.

June 22, 1926. Purulent infection of wound.

June 29, 1926. Infection of wound improving.

September 12, 1926. Patient free from symptoms. Abdominal incision firm.

March 6, 1927. Abdominal wound firm. Patient free from symptoms.

(No discussion)

PERFORATED DUODENAL ULCER. ACUTE APPENDICITIS TWO AND ONE-HALF YEARS POSTOPERATIVE

J. WILLIAM HINTON, M.D.

J. B. admitted to Bellevue Hospital October 5, 1924; discharged October 18, 1924.

Present Illness. Sudden onset of abdominal pain localized in upper abdomen followed by vomiting. Pain did not radiate. No history of previous attacks. For fifteen years has suffered from indigestion, nausea and dull pain in the epigastrium. Occasionally vomits. Constipated.

Past History. Irrelevant.

Examination. Poorly nourished and developed. Arteries markedly sclerosed. Abdomen board-like. Rigidity more marked in upper abdomen, with marked tenderness. Extremities

negative. Urine contained faint trace of sugar and slight amount of albumin. Leucocytes 8600. Polymorphonuclears 70 per cent, transitionals 2 per cent, lymphocytes 28 per cent.

Preoperative Diagnosis. Perforated duodenal ulcer.

Operation. Abdomen opened through upper right rectus—splitting incision. On opening peritoneum gas and free fluid escaped. Duodenum delivered. Perforation found about 0.5 cm. in diameter. Ulcer excised by the Horsley technique. Wound sutured transversely with No. 1 chromicized catgut, one layer of sutures being used. Abdomen cleansed by suction and closed in layers without drainage. No. 2 plain catgut for the peritoneum, No. 2 chromicized catgut for muscles and fascia; silkworm-gut for retention sutures; silk for skin.

Follow-up. Patient feels well, no complaints, except occasional pain in region of wound especially in bad weather. Has been following diet. Scar firm.

Re-admitted February 22, 1927; discharged March 9, 1927.

Present Illness. For thirty-six hours pains in right abdomen in acute attacks. Vomited slightly four hours later.

Examination. Old rectus incision healed. Good result. No herniation. Tenderness in right lower quadrant and muscle spasm. No rigidity or tenderness elsewhere. Rectal examination shows right side tender. Urine negative.

Blood Count. Leucocytes 13,500. Polymorphonuclears 80 per cent, transitionals 20 per cent, lymphocytes 10 per cent.

Preoperative Diagnosis. Acute appendicitis.

Operation. Abdomen opened through a low right rectus—splitting incision. Cecum was found bound down. Appendix acutely inflamed, base perforation, with some free fluid. Appendectomy; stump carbolized, not inverted. Drain inserted to the cecum. Incision was extended upwards and the duodenum exposed. There were no adhesions and the omentum was entirely free. No evidence of remaining ulcer could be detected by palpation or inspection. Abdomen closed in layers as before.

(*No discussion*)

PERFORATED DUODENAL ULCER. RECURRENCE OF SYMPTOMS WITHIN THREE MONTHS

J. WILLIAM HINTON, M.D.

V. F., admitted to Bellevue Hospital May 12, 1925; discharged June 9, 1925.

Present Illness. Complains of cramp-like intermittent pain in umbilical region, with nausea and vomiting and difficulty in respiration for twenty-four hours. No chills or urinary discomfort. Pain relieved by an enema. Three years ago had similar attack of pain for a few hours. Since that time has had numerous attacks of pain and distress in abdomen, with nausea and vomiting, which last a few hours.

Examination. Abdomen moderately rigid. Part of it seems to be voluntary. Moderate tenderness in right umbilical region. Rigidity more marked in right lower quadrant. No masses felt. Rectal palpation, definite tenderness above prostate, more marked in midline with tenderness on both sides. Leucocytes 17,600, polymorphonuclears 88 per cent, lymphocytes 12 per cent. Urine negative.

Preoperative Diagnosis. Acute appendicitis.

Operation. Abdomen opened through a right rectus—splitting incision. On opening abdomen free fluid not encountered. Appendix appeared normal; removed. Stump carbolized and inverted. Incision extended upward. Small amount of straw-colored fluid found in upper abdomen. First portion of duodenum had the omentum plastered over it with exudate around duodenum. On removing the omentum perforation about 2 mm. in diameter was found. Duodenum was mobilized and Horsley pyloroplasty performed, extending incision one inch on duodenum and one and one-half inch on stomach. Ulcer-bearing area excised, wound sutured transversely with No. 1 chromicized catgut, three sutures being taken for the closing. Omentum plastered over duodenum. Abdomen closed in layers without drainage.

Follow-up. September 6, 1925. Patient states that one month ago symptoms similar to those before operation returned with acute onset of pain.

October 4, 1925. Patient states that he is free from pain at present time. On diet, with alkali powders. Roentgenograms reveal a duodenal ulcer.

December 6, 1925. Patient states he was free from pain until four days ago when he began having pain just before meals.

January 3, 1926. Patient states he is much improved and has only occasional pain since his last visit. To continue on his diet.

April 11, 1926. Free from symptoms for the past two months. Is continuing diet.

March 7, 1927. Free from symptoms at the present time. Has had attacks of abdominal

pain, usually at night, lasting two hours in early hours of morning. Last pain one and a half month in duration. Advised to have operation if pain continued.

(*No discussion*)

ANTECOLIC PÓLYA RESECTION OF THE STOMACH WITH ENTEROANASTOMOSIS

CHARLES L. GIBSON, M.D.

Case I. F. H., aged forty-six years, admitted February 8, 1927 with gastric symptoms of long duration, and gnawing pain in epigastrium of three weeks' duration. The pain was quite severe, associated with meals, and relieved by soda bicarbonate. No nausea or vomiting. Had lost considerable weight since onset of illness.

Physical examination essentially negative. Fluoroscopic examination showed a large, long stomach, with a perforating walled-in niche on the lesser curvature with fixing adhesions. Ewald meal showed a free HCl content of 46 and total acids 71; no blood. Wassermann reaction, 4 plus. Urine and blood negative.

At operation the stomach was found to be large and low with an ulcer on the lesser curvature in the center of area of induration. Subtotal gastrectomy was done and the duodenum was closed. An antecolic Pólya-Mayo operation was also done with enteroanastomosis of the two loops of jejunum by a Murphy button.

Postoperative course absolutely smooth and uneventful, without distension, vomiting or discomfort. Patient discharged on the eighteenth day.

May 6. He continues to feel entirely well and has gained eleven pounds.

Case II. P. M., aged 34 years, was admitted November 17, 1926 with epigastric pain of two years' duration. Pain came on two hours after meals and at night. It was relieved by eating and by bicarbonate of soda. In the last attack he vomited coffee-ground material. The illness was marked by remissions and increasing severity of attacks.

Physical examination was essentially negative. On the medical ward, the patient was found to have mild secondary anemia, and stool and vomitus contained much blood. There was no free HCl and the total acids were diminished in the stomach contents. Fluoroscopic examination showed an incisure of the greater curvature and an irregularity of the lesser curvature. A diagnosis of ulcer was made but carcinoma could not be ruled out.

At operation, on the lesser curvature at the junction of the lower two-fifths with the upper three-fifths was an indurated ulcer evidently perforating into the gastrohepatic omentum. It was about the size of the last phalanx of one's thumb. There was no evidence of metastases or nodes and it was resectable; but in view of the possibility of carcinoma it was deemed wisest not to do a sleeve resection.

Therefore, resection of somewhat more than the distal half of stomach by Pólya-Mayo procedure, antecolic and with an enteroanastomosis by small Murphy button, about 5 inches away from the anastomosis was made. Duodenal stump closed in three layers, mucous membrane separately. A fourth row attached it to the capsule of the pancreas.

Pathological report showed gastric ulcer and gastric arteriosclerosis. Convalescence was uneventful and the patient was discharged on the twentieth day. He now "feels fine," and has gained 15 pounds.

Case III. M. W., aged thirty-nine years, was admitted March 10, 1927, complaining of pain in the midepigastrium of two weeks' duration and gastric symptoms for many years. He was greatly emaciated. Fluoroscopic examination at the Cornell Clinic showed a duodenal ulcer with almost complete obstruction. There was somewhat lowered acid content by Ewald meal test.

At operation an ulcer was found on the duodenal side of the pylorus. Just as the stomach was lifted the ulcer perforated and a small amount of material came out. An antecolic Pólya resection was done, the line of section going through the stomach at about the junction of its distal thirds. An enteroanastomosis of the afferent and efferent loops was made with Murphy button.

Postoperative course was entirely uneventful until the seventh day when the patient had a sudden attack of severe abdominal pain, board-like rigidity and extreme tenderness. Diagnosis of perforation was made. At reoperation it was found that the Murphy button had cut through without any union so that in each loop there was a large hole. These were sutured with catgut. The Murphy button was felt inside the gut in the pelvis.

Following this the patient made a rapid recovery and was discharged the fifteenth day

after second operation. Today he is in excellent condition and has gained 20 pounds.

Discussion

Dr. Richard Lewisohn: I have not been successful with the antecolic anastomosis; my mortality rate has been very great with this procedure. With retrocolic anastomosis, however, my results have been very good. Having seen Dr. Gibson's good results, I may be tempted to try the antecolic Pólya operation again.

INJURY TO THE COMMON BILE DUCT WITH REPAIR

THOMAS H. RUSSELL, M.D.

Case 1. Mrs. N. B., aged fifty-six years, consulted me June 1, 1924, because of pain in the upper abdomen, worse in the right upper quadrant and referred to the right shoulder blade. The pain was colicky in character, radiated to the back and the shoulder blade, appeared one-half hour after meals, and lasted from two to three hours. It was always bad in the early hours of the evening. She was nauseated most of the time and felt bloated with gas. Constipation was very troublesome. No history of severe pain requiring a hypodermic injection, nor jaundice. Pain was much worse and continuous for the preceding three days. The appendix had been removed four years before for acute appendicitis.

Physical examination was negative except for general tenderness of the upper abdomen, a palpable, tender mass in the right upper quadrant, and some rigidity of the right rectus muscle. The patient was emaciated and appeared to have lost weight recently. Urine examination was normal, blood pressure was not recorded. On June 5, 1924 she was admitted to the Post-Graduate Hospital with the diagnosis of noncalculous cholecystitis.

On June 6 the gall bladder was removed in a routine manner from below upwards. The operation was performed by me without difficulty, in fact it appeared exceptionally free from difficulty. The gall bladder was distended, its walls markedly thickened and there was considerable edema about the lower end extending into the cystic duct. There were no stones. A cigarette drain was inserted to the foramen of Winslow and the wound was closed.

Pathological examination confirmed my macroscopic findings.

The patient did exceptionally well for two days, but at the beginning of the third day, she became nauseated and very restless, the abdomen became somewhat distended, and gastric lavage and enemas gave little or no relief.

On June 9, three days postoperative, the sclerae began to show the presence of jaundice, the urine contained bile, and there was a clay-colored stool after a cathartic. The next day all these symptoms were more marked.

Blood examination then showed:

Nonprotein nitrogen	15.0
Uric acid	25.9
Urea nitrogen	12.6
Cholesterol	0.150
Chlorides	0.425
Icterus index	62.5

I felt sure that I had injured the common bile duct so Dr. Paul Klemperer and I examined the specimen which I had removed to determine if I had excised a piece of the common duct by angulating it from undue traction on the gall bladder in its removal. The specimen had been placed in formalin solution so this examination was not helpful.

The next day, June 11, I reopened the wound, under ether anesthesia. A good exposure was obtained by simply removing the sutures. There was no bleeding. The common duct was found without difficulty as the upper end of it was very much distended, and there was a ligature causing a constriction about the site of the junction of the cystic duct. This ligature was removed without difficulty. There was a discharge of a large quantity of bile and the lower end of the common duct which had also been caught in the same ligature receded for about ½ inch. I found that I had excised about ⅜ inch of the common bile duct just where the cystic duct had joined it. The lower end was found to be patent as a small probe could be passed through into the duodenum. The duct was unusually small.

I found that I could easily approximate the ends of the divided duct so decided to do an end-to-end anastomosis over a small rubber tube.

Sutures of No. 1 chromicized catgut were used, about 6 interrupted stitches, to bring the ends together. They were not tied until the end of a very small rubber catheter had been introduced into the lower end of the duct to a point just within the duodenum; the upper end

of the catheter was then cut off leaving a piece about 2 inches long; the upper end of this short piece was introduced into the upper end of the duct and then the sutures were tied, approximating the divided ends of the duct and at the same time burying the tube within it. A catgut suture was placed through the duct and tube to hold the latter in place. A cigarette drain was inserted to the point of the anastomosis and the wound was closed in the usual way.

Two days later there was considerable bile on the abdominal dressing but this lasted only two days, when the cigarette drain was removed and there was no further bile drainage.

The patient asked to be allowed to sit up on June 17, which was but six days after the second operation, and due to a misunderstanding on the part of an over-enthusiastic nurse she was allowed up in a chair. She felt so much better that she was allowed to get up daily. The stitches were removed on the twelfth postoperative day and the patient was discharged thoroughly healed on June 30th, nineteen days after the second operation. She has continued well except for some trouble which she has had with a frontal sinus, up to the present time. Roentgen-ray examination of this patient's abdomen on June 24, 1925 showed that the tube had been passed.

This patient never had known that a tube had been buried in her common bile duct, but her son was given a full description of what was done.

I show this case, first, to demonstrate that this accident may happen in even what appears to be a very simple cholecystectomy from applying too much traction on the gall bladder, thereby angulating the common duct and clamping it instead of the distal end of the cystic and, second, to demonstrate that injury to the common bile duct during cholecystectomy can be diagnosed early and with considerable ease and, third, to demonstrate that a good result can sometimes be obtained by means of burying a tube in the common duct, as has been described.

Case II. Miss E. C., aged thirty years, I saw on March 16, 1925 with the doctor who had operated upon her. He stated that he had performed cholecystectomy for cholecystitis four days before, and on the third day postoperative he noticed slight jaundice in the sclerae and the patient did not seem to be altogether as well as the average case of cholecystectomy should be three days after operation.

At the time of the first examination there was perceptible jaundice present, with bile in the urine and none in the feces. The abdomen was somewhat distended, there was nausea and general restlessness. I made a diagnosis of common duct obstruction and suggested that the common duct may have been injured at the time of operation. The doctor explained that while the operation seemed unusually simple in every way he, too, felt sure that there was some occlusion of the common duct.

The next day I assisted him in reopening the wound and looking for the cause of trouble. We found that about ½ inch of the common bile duct at the site of entrance of the cystic duct had been excised, and the two ends of the duct had been ligated in the same ligature. This ligature was released and there was a gush of bile from the upper end of the duct. The bile was aspirated from the abdominal cavity and a probe was introduced through the lower end of the duct into the duodenum. Several interrupted No. 1 chromicized catgut sutures were inserted into each end of the partially excised duct, but not tied until a part of a small rubber catheter was placed in the upper and lower end of the duct. The lower end of the catheter was introduced through the duct just into the duodenum, the sutures were then tied approximating the two ends of the duct and burying the piece of rubber tube in the common duct. A cigarette drain was inserted to the site of anastomosis and the wound was closed. The patient made a splendid recovery, even though bile drained from the abdominal wound for some days.

Three months later, roentgen-ray examination showed the tube still in the common duct. She continued well until the following November, eight months after the operation, when she began to feel nauseated, lost her appetite, and had clay-colored stools, the urine contained a large amount of bile and there was itching of the skin with perceptible jaundice. She was given cathartic salts in warm water before breakfast each morning and improved very much, but the symptoms recurred at intervals of two to three weeks until another roentgenogram January 8, 1926, showed that the tube had been passed through the intestinal tract.

At this time I thought that this patient had a stricture of the common bile duct at the site

of the anastomosis, so I advised her to go into the Post-Graduate Hospital where we could make the necessary tests to be sure of the diagnosis. Just at that time the symptoms began to subside so that the icterus index and indirect VandenBurgh tests were practically normal. In a few days the patient felt well again and was discharged. Five days later the jaundice, intense itching of the skin, nausea and vomiting reappeared so she was readmitted to the hospital. At this time the urine was deeply colored with bile, the icterus index was 44.1, the indirect VandenBurgh test showed 5.6 grams to 100 c.c. of blood. Dr. John Erdmann was called in consultation, and he advised further conservative treatment. The patient remained in the hospital until February 11, 1926, when she felt much better and left.

On June 2, 1926 she was readmitted. She stated that since leaving on February 11 she had had five attacks of jaundice associated with clay colored stools, dark urine, pruritus, each attack lasting from a week to ten days; but the jaundice had never entirely disappeared. At this time the icterus index was 11.5, white blood cells 10,800, red blood cells, 3,848,000, hemoglobin 10 per cent, and the urine showed a marked trace of bile.

On June 11, 1926, I reoperated upon this patient and found at the site of the anastomosis a stricture of the common duct which was about ¼ inch long and through which I could not introduce a very small probe. I attempted to mobilize the duodenum, suture it to the liver and introduce the end of the common bile duct above the stricture into a new opening into the duodenum, thus doing away with the distal end of the bile duct; but I was unable to make a satisfactory mobilization of the duodenum on account of adhesions so this procedure was abandoned. I divided the stricture longitudinally and again introduced a tube into the common duct just as was done in the former operation, except that the lower end of the tube did not extend into the duodenum. This tube was sutured into the duct with one silk stitch, care being taken to pass the suture through the wall of the tube and not into its lumen. The patient made an uneventful recovery and was discharged from the hospital seventeen days later.

The patient remained well until about six weeks ago when she began to show symptoms again of common duct obstruction. Another roentgenogram, made only a few weeks ago, showed the tube still in the common duct.

I then referred this patient to Dr. Howard Shattuck for medical treatment. He thinks that there is an occasional plugging of the tube, but since he has been treating her she has gained weight, is very comfortable and continues her work as a teacher.

Discussion

Dr. Edward C. Brenner: I should like to know Dr. Russell's opinion regarding the outcome of the case in which the catheter was twice introduced into the common duct.

Dr. Russell (closing): I do not know what the outcome in this case will be. She is already having trouble.

ABSENCE OF THE GENITAL ORGANS IN A GIRL

THOMAS H. RUSSELL, M.D.

L. A., aged twelve years, was admitted January 31, 1927, for a hernia on the left side.

Present Illness. While swimming in July, 1926 she felt something give way, and her mother noticed a lump in the left inguinal region. A physician prescribed a truss, which was worn for some time, but recently the girl had been having severe attacks of pain in the groin.

Family History. Father and mother alive and well. No chronic illness in the family.

Past History. Was treated in the Post-Graduate Hospital two years ago for curvature of the spine and club feet.

Physical Examination. Some deformity of the feet. There is a mass in the left inguinal region the size of a thumb, which is freely movable, and appears to be in a hernial sac. There is an impulse from coughing and exertion.

The clinical picture is that seen in an undescended testicle in a male.

Operation February 2, 1927. Usual incision for left inguinal hernia disclosed a distinct hernial sac containing a mass the size of a small thimble projecting from the external ring and reflected upwards on the external oblique muscle. The external oblique muscle was divided and the sac was found to emerge from the internal inguinal ring. Sac opened. The contained organ had all the appearances of a normal testicle with a very small vas extending retroperitoneally into the pelvis. I introduced my finger into the pelvis for exploration and

could not feel any uterus or tubes, so I reflected the inner margin of the skin to the inner side after elongating the incision and made an additional opening into the abdominal cavity through the rectus muscle to enable a more thorough abdominal exploration.

I found complete absence of uterus, and appendages. The bladder rested immediately against the rectum.

In each side of the true pelvis, there was a retroperitoneal mass, the size of a normal kidney—unquestionably the kidneys. There were no signs of the kidneys in the usual location for those organs.

With the left hand in the pelvis, a Kelly forceps was introduced from without, into what appeared to be the vagina, but the end of this forceps passed immediately into the bladder. A more careful examination revealed complete absence of vagina and clitoris.

The appendix, which was fastened by adhesions to the pelvic brim on the right side, was liberated and removed. The second abdominal wound was closed. The hernial sac was resected and the organ returned to the pelvic cavity. Wound closed.

The pathological examination revealed an acute appendicitis of moderate grade.

When I explained the condition found at operation to the mother she told me that she had had the child operated upon principally because of the abdominal pain which she thought was due to the rupture, but which I think was due to the appendix, and also because she thought it might stop the child from the habit of masturbating which had become very noticeable.

I had Dr. James N. West of the gynecological department at the Post-Graduate Hospital make an examination with me before discharge from the hospital to determine whether anything could be done with the idea of constructing a vagina. He concurred in the correctness of the diagnosis of absence of the vagina and advised against any operation for constructing a vagina.

The patient was discharged from the hospital eleven days after the operation.

(No discussion)

MAJOR THORACOPLASTY FOR CHRONIC EMPYEMA. TWO CASES

JOHN H. GARLOCK, M.D.

Case 1. E. K., male, aged twenty-four years, was first admitted to the Second Medical Division of the New York Hospital on May 3, 1925, with a lobar pneumonia, involving the right lower lobe. This was followed by an empyema which, upon aspiration, cultured streptococcus hemolyticus. The patient was transferred to the Second Surgical Division, service of Dr. Pool, and on May 16, 1925, under local anesthesia, a portion of the ninth rib posteriorly was excised. About two quarts of fairly thick pus were aspirated. Two rubber tube drains were inserted and the cavity was later dakinized. The patient did well, and was discharged to the country July 1, 1925, with a small wound draining a small amount of purulent fluid.

He was readmitted July 13, 1925 with the history that while in the country he had fever and increased discharge from the sinus. Roentgenograms at this time showed a thickened pleura with a collapsed lung. There was no evidence of encapsulated fluid. On two occasions, the sinus was enlarged. It was evident that there was a large empyema cavity. As the patient was in rather poor condition, he was given two transfusions and discharged October 4, 1925, to the country. It was recommended that after his general condition had improved, he was to return for obliteration of the cavity.

He was readmitted May 6, 1926 with the history that he had remained in the country for one month and then had returned to light work. It was noted that for the past six weeks there was evidently a communication between the pleural cavity and a bronchus. The cavity had a capacity of 16 ounces. The man's general condition was fair. He had lost considerable weight and presented the picture usually associated with moderate chronic sepsis. It was decided to obliterate the empyema cavity by a graded operation, using essentially the method described by Keller of Washington.[1]

The first stage was performed May 11, 1926, under ethylene anesthesia. The cavity was found to extend from the dome of the diaphragm to the second interspace and from the posterior axillary line to the vertebral column. It was lined by a thick, hard, greyish-green membrane. The ninth and tenth ribs were excised, the point of division of each rib being one inch outside the lateral limits of the cavity. The muscles were cut between clamps

[1] Keller, W. L. The treatment of chronic empyema where the recognized surgical procedures have failed to product obliteration. *Ann. Surg.*, 1922, lxxvi, 549; 700.

and preserved. Parietal pleura was excised and the skin flaps sutured to the pleura over the divided muscles. The wound was then carefully dakinized.

On May 22, 1926, under ethylene anesthesia, the second stage was performed. The eighth and seventh ribs were excised, the same procedure being used as in the first stage. The cavity was again treated by the Carrel-Dakin technique.

On June 8, 1926, the third stage was done. The skin flaps were dissected. The muscles were

Fig. 1. Case 1. Photograph after the third-stage operation.

divided. The scapula was pulled forward, and the fifth and sixth ribs were excised. The skin was then sutured to the pleura, preserving the muscles. The wound was again dakinized.

On June 24, 1926, the fourth stage was done, repeating the same procedure, and excising the third and fourth ribs. At the upper end of the cavity was found a pleurobronchial fistula, measuring 2 cm. in diameter, apparently corresponding to the eparterial bronchus. Following this, the wound was again treated by the Carrel-Dakin method.

On July 6, and again on July 7, the entire cavity was packed with gauze, saturated with 2 per cent alcoholic solution of gentian violet. This is supposed to aid materially in removing the superficial layers of the pleura. The wound was then dakinized and on successive dressings it was seen that the superficial layers of the visceral pleura peeled off.

On July 17, 1926, the bronchial fistula was closed by a method used originally by Dr. Pool in a case of bronchial fistula following a lung abscess. This case was presented at the New York Surgical Society and is reported in *Annals of Surgery*, March, 1927. The skin flap on the outer side of the wound was dissected free, and the rhomboideus minor muscle was isolated. The edges of the bronchial fistula were freshened with a currette, and the pedunculated muscle flap was placed into the fistula, so as to plug the bronchus. It was sutured to the rim of the opening with interrupted chromicized catgut stitches. The viseral pleura was then subjected to discission, after the method of Ransohoff. The wound was packed and the patient was kept under the influence of sedatives, to prevent any subsequent cough. The fistula remained closed and the muscle united by practically primary union. The wound was later dakinized and during this process, the viseral pleura was removed piecemeal. After obtaining 6 successive negative cultures, the cavity was closed on September 1, 1926. In the meantime, the lung had expanded considerably. This closure operation was performed in the following manner: The skin flaps were well mobilized. The surface of the lung was curretted lightly. The anterior segments of the fifth, sixth, and seventh ribs had regenerated for a distance of one and one-half inches; these were excised. The various muscle flaps were mobilized and sutured together, across the cavity. These muscles included the trapezius, serratus magnus, levatores of the scapula, and part of the latissimus dorsi. To favor agglutination to the pleura, considerable counter pressure was used. Two long rubber tube drains were placed between the muscle planes. These were removed in forty-eight hours. The wound healed by primary union and the patient was dicharged from the hospital eighteen days later. Since then, he has gained 30 pounds in weight, has returned to his former occupation, and has no symptoms referrable to his cardiorespiratory system.

This case is presented, first, to call attention again to the graded type of operation for chronic empyema in patients who are in poor condition, and who are unable to withstand a major procedure in one stage. With the graded operation, the margin of safety is considerably increased with a consequent marked diminution in mortality rate. Second, the case illus-

trates the use of a pedicle muscle flap in the closure of bronchial fistulae.

Case II. R. A., male, aged nineteen years, has been ill almost continuously since the age of three, when he had pneumonia. Following his pneumonia, he was confined in various tuberculosis sanitaria over a period of nine years. The diagnosis of tuberculosis, however, was never made. Three years ago, his condition was diagnosed as bronchiectasis, and a pneumothorax was induced without much benefit. Four months ago, he had a left lower lobar pneumonia which was followed by empyema. This remained untreated until the day of his admission, August 24, 1926, to the Second Surgical Division of the New York Hospital. Roentgenograms at that time showed an extensive empyema cavity in the left chest. On the following day the patient was operated on and a segment of the eighth rib was resected. About 300 c.c. of greenish-yellow pus was evacuated. This cultured pneumococcus, group IV. Following the operation, convalescence was slow, and a chronic empyema cavity seemed inevitable. The lad was sent to the country with a discharging sinus.

The wound healed, but reopened after ten days, and discharged a considerable amount of pus. While in the country, he gained 12 pounds. He was readmitted to the hospital October 27, 1926. The cavity was then carefully dakinized. On December 11th the wound was enlarged and it was found that the eighth rib had regenerated considerably, forming a thick bony plate. This was excised, and the cavity was then again dakinized. There was no appreciable decrease in size, following this procedure. It was then decided to perform thoracoplasty. The first stage was executed December 20, 1926. The patient at this time was not in very good condition, and a graded operation seemed definitely indicated. The eighth and seventh ribs were excised, so that their cut ends lay about one inch outside the lateral limits of the cavity. The divided muscles were placed beneath the skin flaps which were sutured to the parietal pleura. The wound was then dakinized.

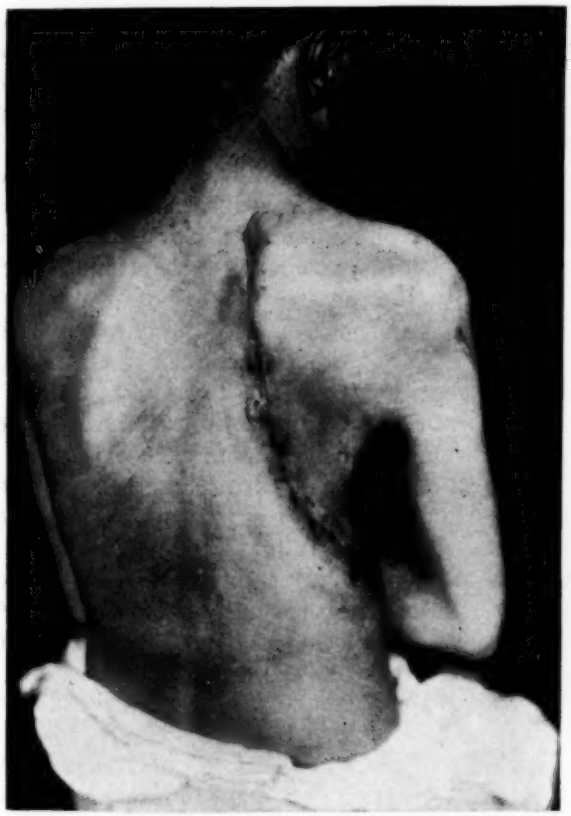

Fig. 2. Case I. Photograph after final operation.

Fig. 3. Case II. Showing clearly the extent of the empyema cavity, the turned-in skin flaps and the criss-cross Ransohoff discission of the viseral pleura. This is now ready for closure.

On January 13, 1927, the second stage was performed, repeating the above procedure. The fifth and sixth ribs were excised. The cavity, whose capacity measured eighteen ounces, extended mesially as far as the vertebral column, and laterally to the posterior axillary line. On January 24, 1927, the patient was transfused.

On February 5, 1927, the third stage was performed. Seven inches of the fourth and third ribs were excised. The muscles were preserved beneath the skin flaps which were sutured to the parietal pleura. On the same day, another transfusion was given. The upper limit of the cavity had been reached at this stage.

The next step in the procedure involved the removal of the viseral pleura. On two successive days, the cavity was packed with gauze saturated with 2 per cent alcoholic solution of gentian violet. Following this, the cavity was dakinized and the superficial layers of the pleura, which was remarkably thickened, peeled off. On March 8th, an attempt was made to decorticate the lung. A definite cleavage plane could not be found, therefore a Ransohoff discission was performed. On successive dressings, the small squares of pleura produced by this discission were excised. This resulted in considerable expansion of the lung, but it was evident that there was fibrosis extending into the lung parenchyma.

About three weeks ago, a small bronchial fistula appeared over the center of the viseral pleura. This was treated by applications of gentian violet, and it is now practically healed.

At the present time, the empyema cavity is wide open, there is considerable expansion of the lung, and the final stage, plastic closure, will be undertaken as soon as six successive negative cultures are obtained.

This case is presented to show a patient with chronic empyema in the process of having his cavity obliterated, and to indicate graphically the method used.

(*No discussion*)

COLIC INTUSSUSCEPTION

EDWARD D. TRUESDELL, M.D.

A boy, aged seven years, was admitted to St. Mary's Free Hospital for Children November 19, 1926. He had been sick four days. During the first two days he had what appeared to be a respiratory infection. For this he was given large doses of a proprietary cough remedy. During the two days preceding admission to the hospital his condition was aggravated by the onset of severe abdominal pain, vomiting and bloody stools. At the time of admission he presented a rigid abdomen with an indefinite mass in the left upper quadrant. There was also elevation of temperature with high leucocyte count.

Under ether anesthesia a mass was felt in the left upper abdomen, having the characteristics of an intussusception. Upon opening the abdomen an excessive quantity of watery exudate, having a colon bacillus odor, was encountered. The intussusception was found to be composed entirely of large intestine, the transverse colon and the adjoining portion of the ascending colon having entered the descending colon. The intussusception was expressed with considerable difficulty, particularly the final portion, the procedure requiring two enlargements of the incision. Upon the expression of the intussusception it was found that practically the entire length of the large intestine possessed a definite mesentery which had predisposed toward the development of the intussusception.

The first two days of the convalescence were stormy, the patient having an exceedingly high temperature, rapid pulse, cough and congestion of the lungs. Thereafter the convalescence progressed uneventfully.

The points of particular interest are the occurrence in a boy seven years of age, of an intussusception of the colic type, the presence of a mesentery to the ascending and descending colons and the presence of a peritoneal exudate presenting a colon bacillus culture, which resolved without evidences of peritonitis, localized abscess, or other interperitoneal complication.

(*No discussion*)

DEMONSTRATION *of* INSTRUMENTS

APPARATUS FOR DIRECT BLOOD TRANSFUSION DEVELOPED BY DR. R. W. THAYER

MARIUS GREENE, M.D.

This apparatus is intended for use not by specially trained blood transfusion personnel, but by the average surgeon and practitioner under circumstances where sterility is obtain-

able with difficulty, and when there is lack of skillful assistance.

The apparatus provides for constant lubrication of syringe piston from above as well as from below, eliminating the danger of sticking of the piston. A provision for 5 c.c. of sterile solution above the piston prevents the entrance of the slightest amount of air into the syringe from above. The apparatus provides for the administration of blood mixed with saline solution, saline solution alone, or blood alone, at will. It provides for washing out of the syringe at will without disconnecting the instrument. It provides for renewal of saline solution after such washing of the syringe. All parts are standard, therefore easily obtainable. The lumen of the syringe is larger than that of the average syringe. Any type of needle can be used, and any type of rubber connection, such as silk rubber connections, paraffine-covered rubber, etc.

Because the syringe is in constant lubrication during the entire procedure of blood transfusion and may be washed out with a sterile soluton at will, eliminating the necessity of spraying ether upon the syringe to prevent clotting of blood and sticking of the piston, this instrument possesses a marked advantage over similar instruments now in use. The volume of a negative suction is so balanced by means of proper weight of the instrument itself that the unpleasant accidents resulting in fainting of the donor due to too extensive suction are overcome.

The construction of the apparatus is extremely simple. It consists of 20 c.c. Record syringe, placed in a tubular frame, which has provision on the bottom to fit a three-way valve, which in turn is attached to the pedestal. A saline solution cup, fastened to the pedestal, is removable. The Record syringe is held in position by a washer, which at the same time serves as a container for sterile solution to be used for the lubrication of the syringe above the piston. The washer is fixed in position by a screw cap. The whole apparatus can be assembled in less than a minute. Its weight is 4½ pounds.

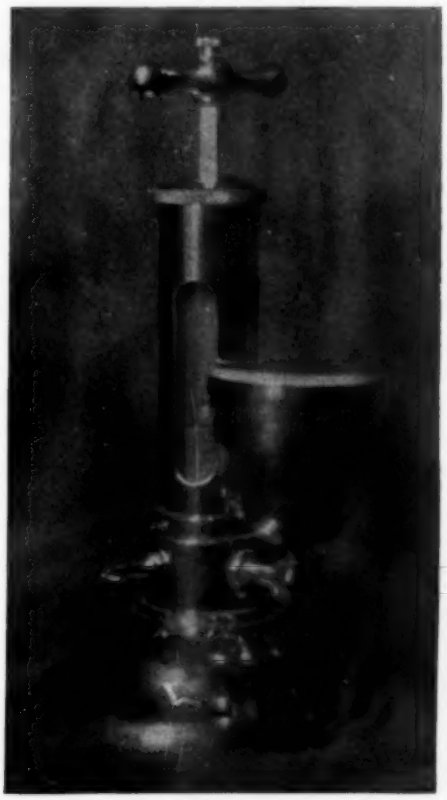

Fig. 1.

To operate it, all that is necessary is to rotate the tubular frame, with the syringe in it, from one opening of the valve to the other, at the same time aspirating and emptying the syringe. The entire procedure can be performed with one hand, leaving the surgeon's other hand free. The instrument is a one-man direct blood transfusion apparatus.

BOOK REVIEWS

ANATOMICAL, PHYLOGENETICAL AND CLINICAL STUDIES ON THE CENTRAL NERVOUS SYSTEM. By B. Brouwer, Professor of Clinical Neurology, University of Amsterdam. 8vo. Cloth. $2.50. Pp. 67; 16 figs. Balt., Williams & Wilkins Co., 1927.

This little volume contains the three Herter Lectures for 1926, delivered at the Johns Hopkins Hospital by Professor Brouwer.

In the first lecture, on "the projection of the retina of the brain," Brouwer gives an outline of his very interesting researches on the course of the fibers from various parts of the retina to the crossed and uncrossed geniculate body in rabbits, cats and monkeys. Minute lesions of the retina were made and the secondary degenerations in the optic nerves, chiasm, optic tracts, and geniculate bodies were studied in serial sections stained by the Marchi method. The author's views on the location of the pathways for monocular and binocular vision are of great interest. In each geniculate body a small part of the ventral border of the periphery contains the fibers for monocular vision, while the greatest portion serves for binocular vision,—the upper half of the retina being represented mesially and the lower half laterally. The macular fibers lie in a localized area. Brouwer is therefore in accord with Henschen as against von Monakow.

The second lecture deals with the organization of sensibility in the nervous system and the results of investigations concerning the development of pathways for various forms of sensation in the evolutionary scale. In this lecture Brouwer made some remarks on the value of lipiodol injections for the diagnosis of tumors of the spinal cord.

The significance of phylogenetic studies for the neurologist is the main topic of the third lecture.

The three lectures, although very short, are very instructive and stimulating, and an evidence of the important researches in comparative anatomy and physiology carried out by the Holland school.—C. A. ELSBERG.

Subscribers to THE AMERICAN JOURNAL OF SURGERY *visiting New York City are invited to make the office of the publishers (Paul B. Hoeber, Inc., 76 Fifth Avenue, New York) their headquarters. Mail, packages or bundles may be addressed in our care. Hotel reservations will gladly be made for those advising us in advance; kindly notify us in detail as to requirements and prices. List of operations in New York hospitals on file in our office daily.*

PROGRESS IN SURGERY

Selections from Recent Literature

EVANS, ARTHUR, and CADE, STANFORD, London. Cancer of the tongue: Preliminary report on radium treatment. *Brit. J. Surg.*, July, 1927, xv, 55.

The treatment of 17 cases of cancer of the tongue is reviewed. In each case the diagnosis was confirmed by histological examination.

In 16 of these cases the primary growth in the tongue completely disappeared after treatment. The technique is described.

No claim is made as to permanence of results; the after-history of the patients alone can decide this.

The paramount difficulty is the treatment of the glandular area. A combination of surgical excision and radium therapy appears to be the most satisfactory method.

DANDY, WALTER E., Baltimore. Glossopharyngeal neuralgia (tic douloureux). Its diagnosis and treatment. *Arch. Surg.*, August, 1927, xv, 198.

Glossopharyngeal neuralgia is a type of tic douloureux exactly like trigeminal neuralgia. Its clinical picture (pain at the base of the tongue and throat on swallowing or talking or in spontaneous attacks) is so characteristic and the attacks so vivid that the diagnosis is easy and unmistakable.

Two cases are reported and appended to eighteen others assembled from the literature. The clinical features are analyzed and tabulated.

The treatment is purely surgical. An operation by which the ninth nerve is sectioned intracranially was carried out in both cases. The superiority of this operation over section of the glossopharyngeal nerve in the neck is due to the fact that other nerves are not injured and the nerve is cut above the ganglion, thereby precluding return of the malady. The operation is practically without danger to life and leaves no subjective or objective disturbance in its wake.

HEITGER, JOSEPH D., Louisville, Ky. Relation of inflammation of maxillary sinus to that of nose and other paranasal sinuses. *Southern M. J.*, August, 1927, xx, 618.

The maxillary antrum is the most frequently involved of all the nasal sinuses.

Polypi in the meati bear the same relation to chronic catarrhal disease of the sinuses emptying therein as the presence of pus in these areas to suppurative sinus disease.

Secondary or recurring polypi are more frequently encountered than the primary type.

Recurring polypi with negative results from antrum puncture may indicate chronic catarrhal inflammation of the antrum. Recurring polypi are the objective symptom of chronic catarrhal inflammation of the accessory sinuses and suggest involvement of the antrum or other nasal sinuses. The most frequent point of origin of recurring polypi lies in the antrum and not, as was formerly considered, in the ethmoid.

Polypi are present in the ethmoid capsule, because the pathway from the antrum leads past the ethmoid.

ROUX-BERGER, J. L., Paris. Removal of the cervical glands in cancer of the tongue. (*Le curage des ganglions du cou dans le cancer de la langue.*) *Presse Méd.*, July 13, 1927, lvi, 881.

The author lays special stress upon the necessity of removing the carotid glands in cancer of the tongue. In performing a block dissection of the neck he proceeds in the following manner. An incision is made along the anterior border of the sternomastoid from the mastoid process to the clavicle. Another incision at right angles to this is made beginning at the point of the jaw. The two flaps formed in this way are dissected back. The cervical fascia is incised in the midline and along the ramus of the jaw. Beginning at the bottom, the attachment of the sternomastoid is severed, the internal jugular is doubly ligated and divided and the mass of tissue is reflected upwards. The submaxillary region is now evacuated. The tissue mass now is suspended only at its upper angle by the sternomastoid. This is then severed, with care to avoid the branches of the facial nerve. The author insists upon the necessity of block removal including the internal jugular vein. Where the tip of the tongue is involved, this procedure must be carried out on both sides. Where the lateral

aspect of the tongue is affected, only the same side must be so removed. If, however, in such a case there are enlarged glands upon the opposite side, simple excision of the glands will suffice because of the frequence with which such glands are merely inflammatory enlargements.

Kopp, J. G., Amsterdam. Bloody discharge from the nipple. (Les écoulements sanguins du mamelon.) *Acta Chir. Scandinav.*, July 28, 1927, lxii, 115.

A hundred and eighty-one patients with breast cancer were found to have a bleeding nipple in twenty cases (11 per cent). In one-fifth of them the discharge was present before the formation of tumor or was the only symptom. In nine of the cases (45 per cent) a cancerous degeneration of a benign tumor was very probable.

Of the forty-five patients with benign tumor of the breast twenty-two had a bleeding discharge. In sixteen cases no tumor was clinically distinguishable, although a duct papilloma or cystic breasts were found, which have a great inclination towards malignant degeneration. Cessation of the bleeding discharge is not a proof of recovery.

The only treatment of all cases of bleeding nipple, even without existence of a tumor, is partial or total removal of the breast. Partial extirpation will not be sufficient in some cases and is therefore seldom advised. Radiotherapy is most uncertain and is not advisable.

Singer, R., Vienna. The first operative treatment of angina pectoris by anterior ramisection of the C_8 to D_3 roots. (*Die erste operative Behandlung der Angina pectoris durch Ramicotomia anterior* C_8–D_3). *Wien. klin. Wchnschr.*, Aug. 4, 1927, xl, 989.

The author calls attention to the fact that in the routine resection of the stellate ganglion in the treatment of angina pectoris, many motor as well as sensory fibers have been cut. Extensive animal experimentation showed that this procedure was entirely unnecessary and even in many cases harmful. The sensory fibers of one side of the heart were through the stellate ganglion of the same side to the rami communicantes of the C_8–D_3 nerves. By actual operation on patients suffering from angina pectoris, Singer believes the existence of the same relationships in the human has been shown. The operation may be done under local anesthesia but is best performed under general narcosis. An incision is made along the posterior border of the sternomastoid muscle. The fascia covering the vertebral muscles is exposed. On it the cervical chain is found and traced down to its enlargement in the stellate ganglion. At this point the ganglion is found lying directly over the first dorsal costovertebral joint. The ramus communicans between the ganglion and the first intercostal nerve identifies the D_1 ramus communicans. The other rami are found lying parallel either above or below. One case is reported in which this operation was performed with satisfaction though only one side was operated upon. Six months after left-sided ramisection, the left-sided pains had completely disappeared and there were gradually diminishing attacks of pain only upon the right side. In the course of the next several months these too had gradually become less and less frequent.

Graham, Evarts A., St. Louis. The treatment of pulmonary suppuration. *Ann. Surg.*, August, 1927, lxxxvi, 174.

Complete rest in bed is of the greatest importance in acute pulmonary abscess. It is often astonishing to see the marked improvement in a case of chronic pulmonary suppuration after the correction of suppuration in the nasal sinuses. Many of those cases associated with spirochetal infections become healed merely by the administration of an intensive course of treatment with neosalvarsan. Such cases are much more frequent than was supposed. During the last year 74 per cent of Graham's cases were found to be associated with large numbers of fusiform bacilli or spirochetes in the sputum. Not all of them, however, will respond to neosalvarsan. Many cases initiated by the aspiration of a foreign body will recover promptly after its removal, but again not all.

Drainage may be improved by posture and by the bronchoscope. But too much reliance should not be placed upon this instrument as a therapeutic agent except for removal of foreign bodies. Despite the claims often made for the therapeutic value of this instrument there have been published practically no statistics giving results of treatment. The type of case in which the bronchoscope is most effective is the type situated at the root of the lung, in which the largest percentage of spontaneous recoveries occurs. Finally drainage may be increased by surgical interference. From an experience based on 329 cases of

pulmonary suppuration, exclusive of empyema and tuberculosis, Singer and Graham feel that the indications for surgical drainage are impelling only in those cases in which the abscess is situated near the periphery of the lung, in those cases in which spontaneous drainage through the trachea has become shut off with a resultant extension of the inflammatory process, and in certain chronic refractory cases. The mortality will be less if surgical drainage is not undertaken too early. It is extremely dangerous to go through a large edematous portion of lung in order to reach the abscess. If the abscess has ruptured into the pleural space, often drainage of the empyema will be the only surgical interference necessary.

Compression of the diseased tissue is a very effective means of obliterating cavities and it also may make the drainage more efficient especially if the abscess is near the hilum. The simplest method of inducing compression is by artificial pneumothorax, the best results of which are obtained in subacute abscesses not located at the periphery of the lung. In the latter cases there is danger of rupturing into the pleural cavity. Artificial pneumothorax must be continued for at least several weeks and sometimes for several months. Other methods of producing compression, e.g., extrapleural thoracoplasty or paralyzing the diaphragm on the affected side by avulsion of the phrenic nerve, should be reserved for relatively chronic cases.

In certain chronic refractory cases it seems desirable to remove some of the diseased tissue. For this, safer than lobectomy is Graham's procedure of cautery pneumonectomy and the modified lobectomy of Whittemore. A series of 45 cases in which the operation of cautery pneumonectomy has been carried out is discussed in which it is shown that in 31 cases, there is freedom from symptoms.

Lilienthal, Howard, New York. Mechanical principles of the operative treatment of pulmonary tuberculosis. *Ann. Surg.*, August, 1927, lxxxvi, 182.

Rest and drainage are the two important mechanical objects of the surgery of pulmonary phthisis. Rest may be temporary and in varying degrees, or it may be permanent in varying degrees even to the complete abolishment of lung function.

There are extrathoracic methods. Those relating to the phrenic nerve are described.

Operations upon the thorax itself deal with rest and with forms of drainage, either by way of the air passages and mouth or out into the world.

The obliteration of pulmonary cavities or of diseased areas of the pleural sac are described. Speaking broadly, this obliteration is a form of drainage.

Pulmonary collapse and compression are aided by the suction power of negative intrapleural pneumatic tension. This negative pressure cannot operate when there is an air passage through the chest wall. It cannot operate in the case of large intrapulmonary cavities which directly open into the normal outside air through a large bronchus.

Methods of operation are described and mechanical principles on which they are founded are discussed.

Yates, John Lawrence, Milwaukee. Operations as aids in the treatment of pleuropulmonary tuberculosis. *Ann. Surg.*, August, 1927, lxxxvi, 200.

The basic obligation of treatment, which is to promote healing of pleuropulmonary lesions with the least cicatrization, is attainable by improving the quality and increasing the quantity of blood delivered to affected lungs and restricting their excursions, by altering intrathoracic tension, and by destroying irreparably diseased structures.

This obligation can be fulfilled whether the disease be incipient or advanced by combining non-operative measures (rest, diet, fresh air, sunshine, and drugs) with operative measures (transfusions of unmodified blood, intravenous administration of salt and glucose solutions, induced palsy of the diaphragm, resection of parietes, and partial or complete lobectomy with cautery).

Holloway, John W., Schlueter, Simon A., and Cutler, Elliot C., Cleveland. The relation of immunity to the experimental production of abscess of the lung. *Ann. Surg.*, August, 1927, lxxxvi, 165.

The authors' dog experiments indicate that the older the thrombus from which an embolus arises, and therefore presumably the more attenuated the organisms within it, the greater the liability to a minor and less disturbing pulmonary complication. To produce abscess we must have on the one hand organisms present of such virulence as to continue growth,

and on the other an immunity insufficient to kill off the organisms when they reach the lung and yet sufficient to wall them off into a localized lesion.

Truesdale, Philemon E., Fall River, Mass. The thoraco-peritoneal operation for hernia of the diaphragm. *Ann. Surg.*, August, 1927, lxxxvi, 238.

Although the stomach and small intestines may pass through the opening in the diaphragm with the transverse colon, when constriction occurs the seat of obstruction almost invariably is in the transverse colon. The preliminary operation of appendicostomy or cecostomy promptly relieves the obstruction. If the diagnosis of diaphragmatic hernia has been established, this minor operation eliminates the necessity of laparotomy and allows adequate time to prepare the patient for the major operation of repair. In addition, it provides a safety valve in case of recurrence or during convalescence when pressure against the reconstructed diaphragm from distended gut below can be reduced to a minimum. The use of the stomach tube before and after operation is also of great value, especially in those cases which involve the stomach alone.

The first steps of the thoracoperitoneal operation should be conducted on the assumption that it will not be necessary to open the peritoneal cavity. In most cases a liberal exposure of the diaphragm through the chest wall will permit a complete reduction of the hernia and closure of the orifice without difficulty. In any case it requires no more time to provide a large window in the thoracic wall. This is done by employing the lapel incision. Beginning at the lower edge of the sixth rib in the posterior axillary line, the skin is divided in a downward direction over the seventh and eighth ribs, where it makes a right angle turn and follows the eighth intercostal space in a forward direction until it reaches the cartilaginous portion where it turns upward, again crossing the seventh and eighth ribs, thus outlining a trap-door. The skin is not dissected off the parietal wall. Returning to the point of beginning the incision is carried through all layers of the chest wall including the pleura. The seventh and eighth ribs are severed in the path of the knife which follows the line of the original skin incision. The flap is thus completed and turned upward on its base. When it is deemed necessary to expose the underside of the diaphragm the vertical incision near the left border of the sternum is continued downward through the left rectus muscle for about 6 cm. to 8 cm. Incising the peritoneum, the diaphragm is then exposed above and below in such a manner as to permit the separation of all adhesions directly under the eye. The sac, if there is one, can be removed readily and its contents replaced below, thus permitting a speedy closure of the aperture. It may be considered of advantage to split the diaphragm from its anterior edge down to the hernial orifice. This gives the appearance of a somewhat radical step, but it permits a better access to the ring and facilitates its closure, with a running suture of chromicized catgut. This line is supported by mattress sutures of the same material. The peritoneal wall is then closed. The thoracic flap is then turned back in its place and closed tight with interrupted sutures of silkworm gut.

Stetten, DeWitt, New York. Ballooning of the left lower abdominal quadrant as an early sign in perforated duodenal ulcer. (With observations on the characteristic spread of rigidity in acute abdominal lesions.) *Am. J. M. Sc.*, August, 1927, clxxiv, 208.

A definite ballooning of the left lower abdominal quadrant has been noted in a case of perforated duodenal ulcer. It is believed that this symptom is an early sign of an acute perforative lesion in the right hypochondrium which is usually a perforation of an ulcer of the duodenum, and that it is produced by the contraction of the right upper, right lower and left upper abdominal quadrants, which have become invaded and rigid, in the order named, while the left lower quadrant is still uninvolved and relaxed. It is important that the significance of this sign and the mechanism of its development be recognized to avoid making the erroneous diagnosis of a volvulus in the left lower abdomen, which it strongly suggests.

Analogous but contrasting progression and distribution of the rigidity and sensitiveness can be observed in other acute abdominal perforations with spreading peritonitis, notably in acute perforative appendicitis with progressive peritonitis.

Kittinger, Alois, Vienna. The treatment of purulent peritonitis with filtrates of cultures of B. coli and other bacteria. (Antivirus.) (*Die behandlung der eitrigen Peritonitis mit*

keimfreien Koli- und Mischkulturfiltraten, Antivirus.) *Wien. klin. Wchnschr.*, Aug. 4, 1927, xl, 997.

Following the work of Besredka, the author attempted to influence the course of purulent peritonitis by means of the intraperitoneal injection of Besredka's antivirus. The reports are on 26 cases of peritonitis due to gangrenous or perforated appendicitis. The appendix was removed in the usual manner, the peritoneal cavity washed and 50 c.c. to 150 c.c. of antivirus injected into the pelvic basin. The abdomen was then closed without drainage. A dressing saturated with the antivirus was applied. All of the cases made an uneventful recovery, though some of the patients were of advanced age. In addition, the author calls attention to the marked relief of pain experienced by those patients in whom the antivirus was used as compared with those in whom it was not used.

Schleuszner, A., Bamberg. Ether treatment of perforation peritonitis. (*Behandlung der Perforationsperitonitis mit Aether.*) *Münchn. med. Wchnschr.*, July 1, 1927, lxxiv, 1091.

The author has used ether in the treatment of peritonitis resulting from perforation. He has compared a series in which ether was used with another series in which it was not used. Of 113 cases treated with ether 12 died. Of another series of 79 cases in which no ether was used but in which the other procedures were exactly the same, 20 died. This decrease in the mortality occurred regardless of the cause of the peritonitis. In the one case, the mortality due to appendicular perforations was reduced from 18.8 per cent to 7.7 per cent. In the other case, the deaths due to perforations from other causes from 50 per cent to 26.1 per cent.

Following operation the ether, never more than 100 c.c., is placed in the abdomen and the wound is closed with drainage. The use of drains is absolutely essential. The author believes that the good results of the use of ether are to be attributed to its bactericidal action, to its action in stimulating peristalsis and in its general tonic effect on the whole body.

Odelberg, Axel, Stockholm. Primary resection of the stomach in perforating gastric and duodenal ulcers. *Acta Chir. Scandinav.*, July 28, 1927, lxii, 159.

Odelberg gives an account of 20 cases of primary resection in perforating gastric and duodenal ulcers. He considers himself justified in drawing the conclusion that to advocates of the methods of resection in the surgical treatment of peptic ulcers, such methods can also be made to include the *early* cases of perforation.

St. John, Fordyce B., New York. Results of the surgical treatment of carcinoma of the stomach. *Ann. Surg.*, August, 1927, lxxxvi, 283.

X-ray examination of the stomach should be carried out wherever even a suspicion of carcinoma of the stomach arises, and in fact even when only unexplained loss of weight exists. Exploration is not contraindicated by an abdominal mass, and resection should be attempted, when metastases are not present, in cases presenting large local lesions, whenever such radical procedure is technically possible. Enlarged regional lymph-glands are not infrequently hyperplastic. The removal of a very extensive local growth may be followed by a brilliant result. Relative prognosis is difficult, despite gross and microscopic study of the specimen.

Of 32 cases in this series of cases of carcinoma of the stomach, where resection was carried out, five patients are alive and well after a period of five years.

McWhorter, Golder L., Chicago. Epidemic acute spastic colitis simulating acute appendicitis or intussusception; association with cervical adenitis and slight pharyngitis; probably one type of so-called intestinal influenza; a possible factor in epidemic appendicitis. *S. Clinics N. Am.*, June, 1927, vii, 507.

McWhorter has seen a number of cases of acute colitis largely of a spastic nature in which the symptoms resembled acute appendicitis and in one case simulated intussusception. Intestinal symptoms, especially diarrhea, are not unusual during epidemics of so-called influenza, and the simulation of a surgical lesion should always be borne in mind.

The history of an epidemic of influenza with intestinal symptoms is of considerable value. Occasionally in localities these epidemics occur with diarrhea, having no definite throat symptoms. They are particularly severe in large institutions. Abdominal pain is usually the first symptom noticed in the spastic colitis type and there is extreme soreness over the

entire abdomen, but it tends to localize sometimes within a few hours to the right side, occasionally to the left. When there is a diarrhea at first the pains do not localize usually until constipation or spastic contraction of the colon develops. Soreness is the chief complaint and it is less marked when quiet and in the absence of food. It may persist for several days to two weeks. Usually in this type of acute spastic colitis one will find a slight redness of the pharynx or the tonsils and the cervical glands are definitely palpable and tender. Rarely do the patients complain of soreness of the throat or acute tonsillitis.

The temperature is usually normal or below at the onset, but may be 100°F., rarely 102°F., during the first or second day. Nausea or vomiting is rare, but may be present after eating or taking medicines. The appetite usually remains good throughout, but food is not tolerated well and increases the distress. The leucocytes usually vary from 8000 to 10,000 and the polymorphonuclears may be around 60 per cent. This is lower than would be expected in a surgical condition with an equal amount of tenderness. Usually there is extreme tenderness over a part or all of the colon. It has been noted more frequently localized over the ascending colon, but may change. The colon may sometimes be palpated and is exquisitely tender. It is felt to be contracted or somewhat edematous and scybala may be felt. There may be distention or the entire abdomen is too rigid for palpation. Muscle spasm is usually less marked and not limited to a small area. Usually the entire side is rigid. The stools may have been slightly loose for a few days before the onset of constipation with the abdominal distress and general weakness. With the onset of constipation there may be no stools for several days. There is often a small hard fecal mass passed several times daily with some mucus or followed by some watery discharge. After a few days there may develop a mucopurulent slightly bloody discharge at the end of defecation, even when only one or two scanty constipated stools are passed during the day. The stools may have a foul or putrefactive odor. There is no relief following a movement, but often a marked weakness. Weakness almost to prostration is commonly present throughout. This is quite out of proportion to the other symptoms. The duration of the spastic colitis is from several days to two weeks, even in the absence of fever. It is easily aggravated by cathartics or food. Frequently other members of the family have had an attack of diarrhea which is a more common epidemic type than the spastic colitis. There have been no cases where this colitis has become chronic.

Epidemics of acute appendicitis have been described. It has also been recognized that some cases of appendicits have followed an acute throat infection.

MARKEY, OSCAR B., Cleveland, and KATO, KATSUJI, Los Angeles. Chronic intussusception. An unusual type with prolapse. *Am. J. Dis. Child.*, August, 1927, xxxiv, 249.

An unusual case of chronic intussusception with prolapse (prolapsus intussuscepti) is reported with clinical and post-mortem observations, and the condition is defined.

Such cases are frequently mentioned in the textbook, but the authors have encountered only seven case reports, most of which are inadequately described, and two of these were in adults.

Prolapsus intussuscepti usually occurs when the mesentery is abnormally long and free, and the usual factors in production of prolapsus take part.

In contrast with simple prolapse, the finger can be passed well up between the intussuscipient normal rectum and the prolapsed intussusceptum, at the same time that the sausage-like tumor can be felt in the left lower quadrant of the abdomen.

The chronicity and recurrence of the condition are explained by varying degrees or absence of intestinal obstruction. In the case reported here prolapse occurred only as long as the child was able to strain forcibly in his attempt to overcome the more or less complete, temporary obstruction of the bowel. After emaciation became pronounced, prolapse no longer occurred.

MILLER, EDWIN M., Chicago. Chronic duodenal ileus. *S. Clinics N. America*, June, 1927, vii, 643.

Chronic duodenal ileus may closely simulate lesions of the gall bladder and ulcers of the stomach or duodenum. The general build of the patient with his long narrow trunk and prominent lower abdomen may be highly suggestive, and the statement of the patient that his distress after meals is greatly relieved by lying down may seem an important bit of

evidence, yet it is only by the finding by means of the fluoroscope of a delayed emptying of the duodenum and a definitely abnormal dilatation of its lumen that a diagnosis can safely be made.

If the symptoms are mild it is possible that by careful attention to the diet, and the putting on of enough fat to increase the support for the abdominal viscera, the more radical measures may effectively be forestalled. In a well-defined case, however, in which a definite obstruction of the duodenum exists and gives rise to serious symptoms, nothing short of surgical relief will suffice.

Van Beuren, F. T., Jr., and Smith, Beverly C., New York. The status of enterostomy in the treatment of acute ileus. A statistical inquiry. *Arch. Surg.*, August, 1927, xv, 288.

The actual value of enterostomy as a treatment of acute ileus must be determined ultimately by statistical proof. Statistics published up to this time do not afford a satisfactory basis for comparison except in a few instances; those are too few for definite conclusions.

Brockman, R. St. Leger, England. Toxemia of acute intestinal obstruction. *Lancet*, Aug. 13, 1927, ccxiii, 317.

It was thought probable on the basis of experiments on animals that the symptoms which develop in intestinal obstruction are due to some interference with physiological function, such as the absence of bile in the small intestine. For this reason bile was injected into the rectum in human cases of acute ileus.

The technique used in this series of cases was to commence with 2 oz. of human bile in 4 oz. of saline solution, repeated every four hours. There is no discomfort caused by using human bile and the patient does not experience any difficulty in retaining the injection. If, however, ox-bile is used, the desired effects are not obtained so easily, nor so quickly, and acute pain of a colicky nature appears, pain so severe as to call for morphia. Also at the end of half an hour or thereabouts the patients often declare that they are forced to return it. If human bile is now used for such a patient there is no further trouble, it is retained with ease and the desired results accrue more rapidly. The same pain was caused by the use of vomited bile in the only case in which it was employed.

The results of this treatment will follow in a case of unrelieved organic obstruction without any passage of feces or flatus. If the full remission of the toxemia and its accompanying symptoms is not obtained, the amount of the bile is increased by half an ounce at a time; the dilution remains in the same proportion.

In most cases after the first rectal injection of human bile the vomiting stops, and even if this is not the result at once it is very much diminished, and an increase in the bile given will secure the desired result. The violent hiccough which so often accompanies ileus, especially in cases of primary small intestine obstruction, will lessen and disappear in a few hours. The drawn, anxious expression fades rapidly. The dry furred tongue will become moist and clean, and will remain so in spite of an unrelieved organic obstruction. In addition, the restlessness is abolished. The patient will volunteer the information that he feels quite a different person from what he did a few hours before, and his whole manner and bearing confirm this statement as being true. Perhaps the most striking manifestation is the softening of the abdomen and the disappearance of the distension, without any passage of flatus per rectum. One is forced to the conclusion that it has gone whence it came and has been reabsorbed.

Susman, M. P., London. Spontaneous rupture of the spleen. *Brit. J. Surg.*, 1927, xv, 47.

A case of spontaneous rupture of an apparently normal spleen in a man of 53 is recorded; only six similar cases could be found in the literature.

Of the seven cases, five had previous digestive symptoms; of these five, one had gallstones and another pulmonary tuberculosis and alcoholism; in the remaining three no cause of the digestive symptoms was found; possibly they were due to some splenic lesion, evidence of which was destroyed at the time of rupture.

Injury to the spleen may cause no immediately alarming symptoms, so that the association between an injury and subsequent rupture of the spleen is overlooked. Post-mortem specimens of healed spleens, and clinical cases of delayed rupture of the spleen, have been described to show that some cases of apparently spontaneous rupture are really traumatic.

Émile-Weil, P., and Grégoire, R., Paris. Operative indications in primitive splenomegalias. (*Indications opératoires dans les splénomégalies primitives.*) *Presse Mèd.*, July 27, 1927, lx, 937.

Splenomegalias may be divided into two main types. The first is the so-called proliferative type in which are included the leukemias, the pseudoleukemias, Hodgkin's disease and sarcoma. In these cases operation is contraindicated. The second is the so-called inflammatory type, in which are included tuberculosis, syphilis, kala azar, malaria, bilharzia, leishmaniasis and echinococcus disease. This type also includes Banti's disease and the more specifically splenic diseases associated with hemolytic icterus, hemorrhages, anemia or increase in the red cells. Before undertaking splenectomy, a careful diagnosis based on a thorough study of the blood must be made. Operation is contraindicated where there is advanced disease of the liver associated with ascites. A marked increase in the total number of red cells also contraindicates operation. Icterus, on the other hand, may be due to intrinsic disease of the spleen and does not in itself contraindicate operation though it may predispose to hemorrhage, etc. For the purpose of overcoming the dangers inherent on icterus, on anemia, as well as the tendency to hemorrhage characterized by long bleeding- or coagulation-time, non-retractibility of the clot, etc., the authors advise the use of transfusion. In the severe cases, this is carried out several times over a period of weeks preceding operation. In the milder cases one large transfusion may be sufficient but all cases get a transfusion of 200 c.c. of blood 1 hour immediately before operation.

Nanta, A., Algiers. Iodine in the treatment of splenomegaly. (*L'iode dans le traitement des splénomégalies.*) *Presse Méd.*, July 9, 1927, lv, 867.

The author calls attention to the fact that iodine is almost specific in its action on lymphatic tissues. The action of iodine in diseases of the spleen is well known among certain Russian and Italian writers. In fact some consider it of equal value with quinine in the treatment of malaria. Others have used iodine as a sclerogenic agent in the various other diseases of the spleen. The author has achieved a marked reduction in size of the spleen in a case of myeloid leucemia. He recommends either oral or intravenous administration. Given orally, the author advises the use of a solution of 1 gm. of iodine and 2 gm. of potassium iodide in 10 gm. of water. Of this solution 5 drops are given every two hours. For intravenous use, the author prefers 1 c.c. to 5 c.c. of Lugol's solution diluted in 5 c.c. to 15 c.c. of water. The treatment must be carried on over a long period of time. He warns against the dangers of iodism and the increased tendency toward hemorrhage. The results, however, are so satisfactory as to counterbalance these inconveniences.

Barnett, L. E., Dunedin, New Zealand. Recent advances in our knowledge of hydatid disease. Echinococcus cysts. *Surg., Gynec. & Obst.*, August, 1927, xlv, 148.

Hydatid disease, though rare in North America and Great Britain, is alarmingly prevalent in South America and is quite common in many other countries. The tenia echinococcus of the dog is the source of the cysts in man.

Barnett states that vast numbers of ova of the tenia echinococcus are passed from the bowels of an infected dog. A human being who fondles such a dog may get the ova on his hands and thus into his mouth, and Barnett believes that this is much the more common method of transmission than through eating of raw vegetable material contaminated by dog's excreta. The raw offal of sheep and cattle that may harbor cysts should not be fed to dogs. Barnett explains how the ova are carried in the blood stream into the liver and the lungs.

The versatility of the scolex in the propagation of cysts as well as of the adult tapeworm is emphasized.

Not more than 50 per cent of hydatid cysts can be diagnosed by ordinary clinical methods, but the laboratory has provided two tests of extraordinary value, the Casoni skin reaction, and the compliment fixation estimation whereby direct diagnosis can be raised to 80 or 90 per cent.

The rarity of hydatid thrill is explained. Exploratory puncture is condemned because of its many dangers.

Operative treatment by open incision, evacuation, and closure without drainage is coming to be recognized as the mode of election.

de Tarnowsky, George, Chicago. Primary echinococcus cyst of the kidney. *S. Clinics N. America*, June, 1927, vii, 783.

Because of the rarity of echinococcus cysts of the kidney, the diagnosis will be in doubt unless the mother cyst ruptures into the pelvis of the kidney and daughter cysts are expelled in the urine, or if—which is extremely rare—bimanual palpation of a kidney tumor gives the examiner the classical "thrill" produced by the rubbing together of daughter cysts.

The blood picture and serodiagnostic tests will be of the greatest assistance. Eosinophilia is present in 80 per cent of echinococcus cyst cases, the percentage of eosinophiles varying between 7 and 40 per cent. Unfortunately, eosinophilia is absent in cases where the cyst is dead, degenerated, or suppurative. It is frequently absent when the cyst has ruptured into the kidney pelvis, because in such cases the cyst content is eliminated with the urine without causing accentuated anaphylactic phenomena.

The complement-fixation test of Bordet-Gengou is positive in 93 per cent of echinococcus cases. The intradermal reaction of Casoni is positive in 90 per cent of all cases.

Puncture of a suspected echinococcus cyst of the kidney is a dangerous procedure. Not only may the escape of the liquid content into the perinephric tissues give rise to severe anaphylactic shock, but daughter cysts may also escape and proliferate de novo in the retroperitoneal tissues.

Marsupialization of the cyst or nephrectomy, if rupture into the kidney pelvis has occurred and the other kidney is normal, are the operations of choice.

O'Connor, Vincent J., Chicago. Traumatic dislocation of the kidney. *S. Clinics N. America*, June, 1927, vii, 743.

Traumatic loosening of the kidney may be gradual, but it is more often due to a sudden rupture of its fascial and peritoneal coverings. Perirenal and periureteral hemorrhage occurs, and the resultant organization about these areas may result in sclerotic attachments which compress or angulate the ureter or renal pelvis. If low-grade infection supervenes in these areas of extravasation the subsequent density of these cicatrices will be increased, and as contraction occurs there will be a gradual compression of kidney, pelvis, or ureter. If the kidney is not displaced and the trauma affects only the perirenal tissue a subsequent perirenal sclerosis may result.

Danhiez, P., Lille. Large renal infarcts. (*Les grands infarctus rénaux.*) *J. d'Urol.*, June, 1927, xxiii, 481.

The author reviews the whole of the discoverable literature on the subject of total infarct of the kidney. There have been apparently no more than 40 cases reported in the literature. The notion of total infarct of the kidney involves necessarily the concept of complete and sudden occlusion of either renal artery or vein. Though the renal vessels are anatomically terminal in nature, functionally there may develop a rather sizeable collateral circulation through the lumbar, the capsular and the ureteral vessels. The infarcts may arise as a result either of thrombosis or of embolus of the renal vessels. The diagnosis has only seldom been made before operation. The symptoms, however, are fairly characteristic. Sudden onset of pain, oliguria, albuminuria and hematuria are the symptoms that should suggest the presence of a renal infarct of large dimensions. The only treatment is immediate nephrectomy.

Hellström, John, Göteborg. Contribution to the knowledge of the etiology of hydronephrosis. *Acta Chir. Scandinav.*, July 28, 1927, lxii, 167.

The author relates two cases of hydronephrosis where the pelvic dilatation was probably caused by the oblique course through the pelvic wall of the upper end of the ureter, probably of congenital origin, and a third case where spastic conditions at the ureteropelvic junction had probably occasioned the hydronephrosis.

Joseph, E., Berlin. Lithotripsy under visual direction. (*Litbotripsie unter Leitung des Auges.*) *Wien. klin. Wcbnscbr.*, Aug. 4, 1927, lxxiv, 1314.

Josephs describes a sterilisable lithotrite combined with a cystoscopic lens which permits of the crushing of foreign bodies under the guidance of the eye. In considering the indications for the use of his instrument, Joseph observes that large vesical calculi are to be removed by cystotomy. Only in the case of pure phosphatic stones of unusual size is the

old method of lithotripsy to be employed. In the case of small stones, lithotripsy under visual guidance is to be undertaken. Lithotripsy is to be used without question in older fat patients, in those suffering from high blood pressure or from diabetes. In the latter case, even after the use of insulin, the author has found cystotomy to be a serious procedure.

Trumble, Hugh C., Melbourne. The treatment of pelvic abscesses. *Med. J. Australia*, July 2, 1927, ii, 4.

Trumble concludes that drainage from the rectum or vagina is immensely superior to drainage through the abdominal wall. It is to be emphasized, however, that only those abscesses which are closed above and which abut directly on the rectum or vagina should be opened from below. The examining finger gives information on these important points.

Jarcho, Julius, New York. Uterosalpingography; roentgenological visualization of the cavity of the uterus and Fallopian tubes after the injection of iodized oils. *Surg., Gynec. & Obst.*, August, 1927, xlv, 129.

Roentgenological visualization of the uterus and Fallopian tubes after the intrauterine injection of iodized oil furnishes a valuable means of gynecological diagnosis in selected cases. It outlines the cavity of the uterus and the various portions of the Fallopian tubes with great distinctness.

In cases of sterility, the procedure gives information as to whether the tubes are patent or not and it localizes the site of occlusion if any. It not only supplements the insufflation of gas but often supplants it.

The technique is simple, but strict aseptic precautions must be taken. Jarcho is opposed to the performance of the test on ambulatory patients.

Proper interpretation of the roentgenological findings requires experience. In some cases, it is advisable to examine plates exposed at successive intervals or from different angles.

In Jarcho's experience, the intrauterine injection of iodized oil is entirely harmless, and no manifestations of iodism have been observed.

Kerwin, William, St. Louis. Ligation of the uterine arteries for control of hemorrhage in placenta previa. *Am. J. Obst. & Gynec.*, August, 1927, xiv, 189.

Kerwin finds that ligation of the uterine arteries in placenta previa, a procedure described by Harold Miller in Am. J. Surg., in 1909, completely controls hemorrhage.

It is simple and can be done in a few minutes by any qualified obstetrician either in a hospital or at home, without injury to the ureters and without incision.

Bonner, Adolph, Brooklyn, N. Y. Carcinoma of the cervix in a thirteen-year-old patient. *Am. J. Obst. & Gynec.*, August, 1927, xiv, 175.

This case of adenocarcinoma of the cervix in a thirteen-year-old girl is the third below the age of fourteen recorded in the available literature. Carcinoma of the cervix below the age of twenty is extremely rare. Cervical carcinoma is not rare between twenty and thirty and the danger of employing the expression "cancer age" literally is obvious. There are many cases of carcinoma of the cervix reported in nulliparous women.

Heineberg, Alfred, Philadelphia. The use of radium in the treatment of endometrioma of the rectovaginal septum. *Am. J. Obst. & Gynec.*, August, 1927, xiv, 235.

Heineberg says that there is a distinct field for the use of radium in the treatment of adenomyoma of the rectovaginal septum especially in those instances in which the tumor is not small enough to be easily removed through vaginal incision, and not so large that all of it cannot be brought under the influence of radium embedded within it. Its use in properly selected cases avoids the necessity for abdominal incision and unsexing the patient.

Roberts, M. Hines, Atlanta, Ga. Intracranial hemorrhage in the newborn. *Southern M. J.*, August, 1927, xx, 642.

Four hundred and fifty routine lumbar punctures were made. Sixty-three, or 14 per cent, of all infants showed macroscopic blood in the spinal fluid, a figure somewhat higher than that found by Sharpe and his associates in similar studies. The percentage of infants showing intracranial hemorrhage in the premature or abnormal labor groups is far in excess of those for the full term and normal delivery groups. In only one case does there seem to be definite evidence of any intracranial lesion. Two others might be classed as doubtful. One is led to believe that the great majority will grow up entirely free of any disorder

attributable to cerebral hemorrhage, though it might be easily possible that some of the obscure mental states coming on later in life, for example epilepsy, could have as their basis such a pathological condition.

Meisen, V., Copenhagen. Injection treatment of varicose veins and their sequelae on basis of 500 treated cases. *Acta Chir. Scandinav.*, July, 28, 1927, lxii, 17.

Since his last communication on this subject Meisen has treated 500 cases of varicose veins including 135 complicated by ulcus cruris and 140 by chronic eczema. The significance of the local, frequently hidden varices and the intimate topographical relation between the varices and the complications form the main part of this article. This is a detail of the greatest significance to this question, because it enables us in each case to make a sure prognosis, and because it gives us a method by which we may cure the very largest number of these complications, no matter how extensive or how old.

The 500 cases received 2224 injections, i.e., an average of 4 to 5 per individual. There were 130 men and 370 women. Fifty-five of the patients gave a past history of phlebitis.

The varicose veins were complicated by chronic eczema of one to ten years' duration in 40 cases, by ulcer of one-half to forty years' standing in 135 cases.

At the discharge of the patients the ulcer was healed in all but 2. There have been only a very few relapses of ulcer, and these were promptly healed by a brief additional treatment.

Whatever the cause may be, the operative treatment of varices frequently gives rise to a relapse of the condition, while the injection treatment does not appear to do so. Weisen is of opinion that the explanation is to be found in that the operative treatment cannot be made sufficiently radical for the reason that the anastomoses cannot be included in the treatment; and the anastomoses are possibly the point of origin of the relapse. The injection treatment, on the contrary, is an elective treatment, because it obliterates all the vein trunks where the blood stagnates or nearly stagnates, varices and anastomoses, while the injected fluid probably is washed away by the circulating blood, should it enter the normal veins.

In palpating the varices it is absolutely necessary to have the patient place the body weight on the affected extremity, if one expects to locate the varices that are to be obliterated. This treatment depends on finding the hidden varices, and that, perhaps, is a matter of training.

Meisen has had no death and no accident with lasting consequences. Severe complications requiring confinement to bed amount to 1.6 per cent of the total number of treated cases.

Meisen now never uses more than 10 c.c. as maximal dose per injection, and considers 25 c.c. as an "infarct-giving dose."

Technique. The patient must stand on a pedestal, a low table or a high chair. Both lower extremities must be bared. By having the patient alternately rest on each foot, one can see which varices are most in need of being obliterated. Compressing the extremity by a rubber band is inadequate and objectionable; in doing so one produces an artificial stasis of all the veins of the extremity. The needle must be sufficiently large to permit the free passage of the blood and the fluid. Meisen uses a solution consisting of equal parts of sodium salicylate, 25 per cent and sodium chloride, 10 per cent.

If this is not effective, then only he uses 25 per cent sodium salicylate, and very rarely 30 per cent, never higher.

The maximal dose per injection is 10 c.c. The needle is inserted with the patient standing. When blood exudes, the syringe is rolled a couple of times between the fingers to make sure that it is not caught by the opposite vein wall. Then the patient is requested to lie down. One must watch the syringe all the time, while the patient changes his position. After a moment the varices are void of blood, and the injection may commence. Like all other intravenous injections, it should be done slowly. In order to avoid necroses, always ask the patient whether *he feels any pain*. If so, discontinue at once. Likewise if the piston meets any resistance. At one spot, however, the injection is always painful—the region of the malleoli when an ulcus is present.

After the injection, and while the leg is still elevated, a gauze pad is laid on, and an elastic web bandage. This exerts a very strong compression, and is an essential part of the treatment.

The injection is repeated every other day, if no tenderness develops. If both legs are attacked, one may inject them by turns every

day. For practical reasons one rarely gives more than one injection a day.

The injection treatment of varices ought to replace the operative treatment, because it is less dangerous and offers far greater advantages, specially as to the sequelae, ulcus cruris and eczema, which it cures permanently in almost every case.

Ulcus cruris is practically always due to varices, even if these are not visible externally, and ought to be treated accordingly.

Pain is the principal indication for the treatment, as ulcus is a very painful ailment.

In the 500 cases were 14 recurrences after operation, 12 recurrences in 150 additional cases. The relapses indicate that the blood from the deeper veins is forced out through the anastomoses.

During the last four months, while a new technique and a new injection fluid have been used, there was no complication.

In 35 cases of hemorrhoids this method has given excellent results.

Allen, Arthur W. End-result in circulatory diseases of the extremities treated by periarterial sympathectomy. *Boston M. & S. J.*, Aug. 25, 1927, cxcvii, 304.

In his last group of eight cases, Allen had two trophic ulcerations in spinal cord lesions healing quickly following sympathectomy, one arteriosclerotic ulcer almost healed, and one trophoneurosis relieved entirely of pain for six months. A long standing case with Raynaud's syndrome plus lues, an atypical thromboangiitis obliterans, an irritative nerve lesion, and a scleroderma were unchanged.

Periarterial sympathectomy has a very limited field. In a case with adequate circulation with vasomotor and trophic disturbances of short duration, where proper protection can be given afterwards, it may be justifiable. It is undoubtedly followed by a temporary hyperemia more effective than that produced by electrical or mechanical measures, which aids in the healing of stubborn ulceration. It must be remembered, however, that the cases benefited by it will probably heal with a longer period of palliative treatment.

The combined operation of Royle and Lèriche as used by Adson may be more effective than periarterial sympathectomy alone, but it is a much more serious undertaking and not without danger. Allen thinks that ramisectomy alone as advocated by Royle is just as effective as the combined operation and is a safer procedure. No ill effects from periarterial sympathectomy were observed in any of his cases.

Hurley, William R. Subfascial hemorrhage of the thigh. *Boston M. & S. J.*, Aug. 18, 1927, cxcvii, 261.

In injuries to the thigh severe and even fatal hemorrhage may occur with very few local signs indicating the presence of such a condition. In cases of thigh injury, careful watch of the condition of the patient should be maintained, particularly with respect to pulse and respiration.

Should symptoms of internal hemorrhage occur, and increase in severity, comparative measurements of both thighs should be made, and in the event that the injured member is larger and also shows tenderness and tension, exploration of the thigh is indicated.

Hurley reports a case and refers to those reported by Larkin.

Jackson, R. H., Madison, Wis. Simple uncomplicated rotary dislocation of the atlas. *Surg., Gynec. & Obst.*, August, 1927, xlv, 156.

Uncomplicated rotary dislocation of the atlas occurs more commonly than is supposed and may easily be overlooked. If the lesion is not recognized and reduced, it may result in sudden death from an increase in the dislocation or it may lead to the development of myelitis months or years after the injury. Rotary dislocation of the atlas is a distinct clinical entity presenting a characteristic history and symptoms with physical findings verifiable by roentgen examination. Effort should be made to reduce the dislocation including, if necessary, resort to open operation.

Conwell, H. Earle, Fairfield, Ala. Treatment of acute comminuted fractures about the elbow joint: Report of sixty cases. *Southern M. J.*, August, 1927, xx, 579.

Consideration is given only to those cases in which severely traumatized soft parts and comminution of the bone were encountered, making the routine treatment by the Jones method impossible. Such cases are unsafe to treat outside of a hospital, because frequent daily inspections are necessary. Treatment of the injury to the soft parts is necessary.

The age of the patients varied from two to sixty-five years. Swelling is in no way a contraindication to immediate attempt at reduction

and functional results are in direct ratio to the elapsed time between the accident and the reduction of the fracture. Immediate manipulation and reduction is carried out under general anesthesia, if conditions permit, and adhesive plaster for traction on the arm and forearm is then applied and the operator holds the arm and forearm in place and accompanies the patient to the ward, where traction is applied to the forearm and the arm with the aid of the author's abduction frame, here described. The traction to the arm and the elbow has a definite tendency to press gently on each side of the elbow, aiding approximation of fragments, with the assistance of two lateral fixation splints. The amount of traction on the arm used is from four to twelve pounds, dependent on the size and age of the patient. Less weight is used on the forearm, the object being to place sufficient traction barely to allow the elbow to touch the board where the arm rests. The abducted position of the arm at the shoulder prevents any rotation of the lower fragment of the humerus on the upper fragment. The frame and traction make dressings, treatment and frequent inspection of the elbow very easy, and allow for adjustments and active and passive motion as well. The amount of elbow flexion allowed in the beginning varies with the type of fracture and the amount of swelling. (In the majority of cases in this series the swelling about the elbow was so great that it was impossible to secure more than right angle flexion without obstructing circulation.) Flexion is gradually increased from day to day, as the swelling disappears, in all fractures until almost the full amount of flexion is obtained, usually in five to six days following injury. Extension is usually accomplished within ten or twelve days following injury, with daily manipulation just to the point of pain to the patient. Active motion is allowed as early as the patient can be persuaded to carry it out.

No forced motion should ever be carried out during the post-hospital period. Let the patient do all the motion, but force the patient. Take care always to prevent undue tenderness or pain. If any tenderness or pain should occur, allow the limb to rest as regards motion, but keep up hot baths, radiant light and other forms of physical therapy.

Speed, Kellog, Chicago. A new type of fracture of the calcaneus, with discussion of the common injuries of this bone. *S. Clinics N. America*, June, 1927, vii, 583.

The type of fracture in two cases reported here does not fit into the usual four types.

The mechanism of these two unusual fractures of the calcaneus is probably as follows:

The patient sustains a sudden slight fall or impaction on the foot, which is probably held in some inversion and with the sole cupped as in pes cavus. The violence is not great enough to cause compression fracture of the whole bone or fracture of the sustentaculum, but the impact brings enough force against the sole of the foot to shorten the lateral portion of the plantar fascia and the flexor digitorum brevis, the abductor digiti quinti, and quadratus plantae of the foot on its side. This shortening in the muscles and fascia already under tension causes the origin of the muscles from the outer anterior under surface of the tuber calcanei to be pulled out, taking a small bone fragment with it. This bone fragment may lie up under the ordinary outline of the calcaneus as seen in the lateral view; it may be in profile. The broken off bone fragment is pulled plantarward and anteriorly and lies sticking down into or toward the plantar tissues.

If the bone fragment is not seen in the first roentgenogram, no fracture is diagnosed. Walking and use of the foot cause pain from pressure against this fracture fragment. The pain will continue for a long time.

To diagnose this fracture of the calcaneus there will be found:

1. Pain and tenderness on the outer aspect of the calcaneus near its middle.
2. Scarcely any swelling or ecchymosis (held back by plantar fascia).
3. Pain referred to the heel when the little toe is dorsal flexed or abducted, or when the plantar fascia on the outer side of the foot is tensed by pressure.
4. No change in relation of malleoli at ankle.
5. No change in hollows about heel posteriorly.
6. Prolonged disability when weight-bearing is attempted.

The treatment must be freedom from weight-bearing until acute pain and reaction subside. This will be six to eight weeks. If pain then recurs when shoes are worn, a soft pad may be put like a bunion plaster around the tender point beneath the heel.

The ultimate prognosis is good, as pain will eventually disappear.

If the fracture is not recognized and weight-bearing is encouraged, the disability may extend for months.

All suspected fractures of the calcaneus should have not only anteroposterior and lateral roentgenograms, but a third film should be made with the inner side of the foot raised so that there is about a two-thirds lateral view to throw into profile any bone fragments torn off from the plantar surface.

Lehman, Edwin P., and Cole, Warren H., St. Louis. Parathyroid hormone and the calcification of fracture callus. *J. Am. M. Ass.*, Aug. 20, 1927, lxxxix, 587.

On the assumption that, because the injection of parathyroid extract increases the calcium in the blood stream there will be more available calcium for deposit in fracture callus, have been based certain clinical trials of parathyroid extract in the treatment of delayed union of fractures. It is the belief of Lehman and Cole, that parathyroid extract is being widely used on the misapprehension that it is of such value. They undertook experiments which present evidence that the favorable results in delayed union that have occurred following the use of parathyroid extract have not come from any beneficial action of the hormone. Four litters of white rats totaling forty individuals were employed. In the white rat, the injection of parathyroid extract does not hasten the calcification of fracture callus. If the injection of parathyroid extract has any influence on the rate of calcification of fracture callus, it tends to delay it. The untreated controls showed an average callus strength of 69.6 per cent of the strength of the normal bone, as compared with 63.7 per cent in the rats given parathyroid injections.

Henry, Arnold K., Cairo. An operation for slinging a dropped shoulder. *Brit. J. Surg.*, July, 1927, xv, 95.

A method is described by which a case of shoulder-drop due to surgical paralysis of the spinal accessory nerve was successfully treated by slinging the scapula to the spines of the sixth cervical and third dorsal vertebræ by means of two 10 in. by ½ in. fascial strips taken from the thigh and passed through holes drilled in the vertebral border of the scapula.

Cox, H. Hoyt, Chicago. Acute backache —diagnosis and treatment. *S. Clinics N. Am.*, June, 1927, vii, 663.

To reduce a sacroiliac subluxation the patient is placed on the table face downward, his weight being supported by the elbows and abdomen and his hands grasping the edge of the table securely. The surgeon stands on the table and lifts the patient by the ankle so that the abdomen is clear of the table and is supported only by the elbows above, making strong traction on the affected limb while his assistant makes firm pressure over the sacrum. The lumbar curve is now restored and the patient's pain disappears. He is then strapped securely with 2 inch adhesive straps extending from below the trochanters to the crest of the ilium.

The explanation of the manipulation is as follows: In lifting the patient's body by the ankles we hyperextend the spine and thus relax the strong posterior sacroiliac ligaments and also relieve the joint from the pull of the hamstrings. The strong pull upon the leg unlocks the joint by increasing the deformity by the pull of the quadriceps muscles attached by the upper part of the ilium. The weight of the body and the downward pressure over the sacrum favor replacement of the ilium backward by forcing the sacrum forward.

Cox advises the patients to go to bed for one week or longer, depending upon the severity of the injury and the time which has elasped before proper treatment has been instituted. Occasionally and especially when a history of previous subluxations exists a firm belt with a sacral pad, lacing down below the trochanters and extending to the level of the iliac crests, should be worn for several months. These patients should be warned against stooping or sudden twisting of the body.

The majority of acute backaches are due to sacroiliac subluxations and their response to the treatment shown is little short of spectacular.

Hirsch, Edwin F., and Capps, J. A., Chicago. Paroxysmal cyanosis associated with bilateral thrombosis of the suprarenal veins. *Arch. Int. Med.*, July 15, 1927, xl, 112.

This is a report of the clinical symptoms in a patient with bilateral thrombosis of the suprarenal veins and acute retrogressive changes of the suprarenal glands in whose body a post-mortem examination did not disclose any other complicating lesion.

In addition to the usual symptoms of supra-

renal insufficiency, such as asthenia, low blood pressure, gastrointestinal disturbances and syncope, there were sudden attacks of extreme cyanosis, associated with dyspnea and unconsciousness.

The suggestion is made that the cyanosis is due to suprarenal insufficiency rather than to weakness of the heart, and that the suprarenal gland may play a rôle in the utilization of oxygen by the tissues.

Cabot, Hugh, and Ransom, Henry K., Ann Arbor. Ethylene as an anesthetic for general surgery. *Ann. Surg.*, August, 1927, lxxxvi, 255.

Ethylene has all of the advantages of nitrous oxide and oxygen and also gives greater relaxation and avoids objectionable cyanosis. It appears to be remarkably free from danger except that possibly resulting from explosions. It will not give complete muscular relaxation particularly for operations in the upper abdomen, and if this is required, it must be combined with local or regional anesthesia if it is used. In the authors' practice it has practically pushed nitrous oxide from the field and will, they believe, for ordinary surgical practice, supersede it. It is not an anesthetic which can be employed except where trained anesthetists are on hand and a rather cumbersome apparatus is available. It is not likely, therefore, to supersede ether or chloroform for use outside of hospitals, but for general hospital practice, it has outstanding advantages.

Snell, Albert M., Rochester, Minn. The relation of obesity to fatal postoperative pulmonary embolism. *Arch. Surg.*, August, 1927, xv, 237.

It seems probable that there is a group of patients over fifty years of age, obese and with normal or subnormal blood pressure, who are particularly susceptible to pulmonary embolism as a postoperative complication.

Phemister, D. B. A study of the ossification in bone sarcoma. *Radiology*, July, 1926, vii, 17–23.

For purposes of roentgenologic study of their ossification, bone sarcomas may be divided into four main groups: (1) those containing tumor bone only; (2) those containing tumorous and non-tumorous bone; (3) those containing non-tumorous bone only; (4) those containing no new bone.

(1) *Bone sarcomas containing tumor bone only* are seen mainly in adults, and are either osteogenic or chondrosarcomas. Osteogenic sarcomas usually arise centrally, erode the cancellous bone and cortex and make a lesion which fills much of the space in the end of the shaft and also appears soon as an external swelling. The degree of ossification varies but is often marked. The new bone forming in the portion of the tumor within the old bone has an irregular spongy arrangement. The external swelling is usually dense and spongy in its deeper portions, but there may be radiating spicules about the periphery. There is no layer of non-tumorous periosteal new bone tapering off on the shaft about the limits of the tumor. Examples are cited from two cases. Radiotherapy exerts little influence on markedly ossifying sarcomas such as occurred in these cases; both had received intensive treatment without noticeable effect.

Primary chondrosarcomas usually show some tendency to calcification and ossification. They may begin peripherally or centrally, a moderate amount of calcified cartilage and bone may appear and these may form islands separate from the old bone. In roentgenograms, isolated calcareous shadows within the confines of a tumor, either primary or metastatic, are almost pathognomonic of chondrosarcoma.

(2) *Bone tumors containing both tumorous and non-tumorous bone* are seen mainly in adolescents. At this age an osteogenic sarcoma with radiating new tumorous bone may stimulate periosteum to form a varying amount of non-tumorous bone on the shaft beyond and along the uninvolved cortex at the level of the tumor. An example of this type of tumor occurring in a boy aged seventeen is cited.

(3) *Bone sarcomas containing non-tumorous bone only* occur also largely in adolescents, and are central destructive lesions which stimulate the periosteum of the vicinity to new bone formation. The non-tumorous new bone has the same characteristic as that described in Group 2. Occasionally there may be irregular ossification about the periphery. Ewing's endothelioma is particularly apt to produce this picture. Radiating, non-tumorous bone, usually limited in amount, may form within the tumor as an outgrowth from the old cortex. An illustrative case is briefly cited.

Telangiectatic sarcomas in adolescents or young adults invade both the cancellous bone and medullary regions and extend through the cortex making a peripheral swelling. They break down rapidly leaving a cavity with only a small amount of living tumor about the

periphery. A small amount of non-tumorous bone may be formed by the periosteum about their limits, but it casts little shadow so that roentgenographically one sees mainly bone destruction and the shadow of the soft parts of the tumor.

(4) *Bone sarcomas containing neither tumorous or non-tumorous bone*, or at most only traces of ossification are common in adults. They arise nearly always centrally although there is occasionally a primary periosteal fibrosarcoma of this type. When small and confined almost entirely to the bone they may be confused roentgenologically with central giant cell tumor, but their outline is much more irregular than that of the latter. They enlarge rapidly and invade the soft parts surrounding the bone. New bone does not form from the periosteum about their periphery. They usually run a rapid course and produce metastases which also are free from ossification. An example is cited of a large central sarcoma of the upper end of the ulna amputated eight months after onset in a man aged twenty-seven.

Pribram, B. O., Grunenberg, K., and Strauss, O. Cholecystography and its diagnostic significance. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, February, 1926, xxxiv, 235–244.

The roentgenological demonstration of the gall-bladder with the aid of contrast dyestuff permits the diagnosis of calcareous gall-bladders, stenosis of the cystic duct, ptotic gall-bladders, etc., with relatively great certainty. On the other hand, when yielding a normal gall-bladder picture it constitutes a reliable means for excluding disease of the gall-bladder. For the diagnosis of pericystic adhesions and altered position of the gall-bladder, it is desirable to obtain additional evidence by means of a collateral duodenal filling and also to make a study of serial roentgenograms of the ability of the bladder to empty and to contract.

The examination should be made primarily upon the gall-bladder which has been emptied. In order to avoid interfering reactions, a prophylactic injection of atropin would appear to be highly desirable. The infusion of dye is best carried out with the aid of an infusion cylinder and should be conducted very slowly. Tetraiodophenolphthalein is preferable to tetrabromphenolphthalein for injection. The quantity sufficient for ordinary purposes is 3 gm., at a maximum 5 gm. The intravenous method has been found to give more reliable results than the oral. The authors recommend the method very highly and regard it as entirely without danger provided the necessary precautions are followed.

Reich, Leo. Diaphragmatic hernia of the right lobe of the liver. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1926, xxxiv, 481–484.

Reports are given of 2 cases. In the first which occurred in a man aged thirty-two a pneumoperitoneum caused a pneumothorax and thus helped to disclose the nature of the condition. The herniated abdominal structure within the thorax was found by a method of exclusion to be the liver. The introduction of contrast material per os or per rectum caused no change in the appearance of the herniated structure. The latter also exhibited considerable mobility with change in position of the patient. The diagnosis in this case was spurious traumatic diaphragmatic hernia of the right lobe of the liver.

The second case occurred in a man aged fifty-nine who gave a picture very similar to that seen in the first case. Here also the pneumoperitoneum assisted in the differential diagnosis by failing to give a simultaneous pneumothorax. The condition was diagnosed as paralysis of the phrenic nerve due to lead poisoning.

Reiser, Egon. Theoretical and personal observations on myelography. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1926, xxxiv, 443–455.

The suboccipital injection of 2 c.c. lipiodol has never resulted in any injury to a patient. It is possible and very desirable to observe the settling of the contrast material roentgenoscopically. It may be expected that such observation in conjunction with a suitable roentgenographic technique (patient in oblique recumbence, i.e., partly upright) will lead to early diagnosis of small tumors. The suspected region should be roentgenographed before the introduction of the lipiodol so as to obtain a record of all changes in the spinal column without interference of foreign material. Such roentgenograms are of importance in the differential diagnosis. These and all other pictures should be taken both sagittally and laterally (or ioblquely).

When the contrast material has been introduced and its progress to the narrowed region traced, roentgenograms should be taken with the patient in the recumbent and in the upright or semi-upright positions. The roentgenograms in the recumbent position frequently show the course of the spinal cord above the point of compression, because the medulla frequently appears as a clear space within the shadow of the contrast material or within two marginal strips. The upright or semi-upright position produces an intimate contact of the lipiodol with the structure which is blocking the spinal

canal. The lower portion of the filling shadow in these roentgenograms indicates the shape of the compressing agent, which may be lost in roentgenograms taken in the recumbent position.

Primary intradural tumors may be recognized as spherical, convexly outlined, clear areas below or within the filling material. Connective tissue atrophy may also produce clear areas, but these usually have a straighter or a concave boundary. This picture may also be exhibited by extradural tumors. Not infrequently, the tumor may be covered over with adhesions, and if the latter should happen to coat the tumor closely like a skin then the picture of the conditions in the zone of compression will not be appreciably disturbed. Should, however, the adhesions be extensive, they may keep the contrast material from reaching the actual point of compression, and it will then be impossible to form any opinion as to the shape of the pathological process producing the compression. Within the clear areas, there may appear disturbing shadows produced by skeletal structures which render difficult the morphological interpretation of the myelogram. Such interferences are mainly due to the spinous processes.

A series of 5 cases is described and pictured.

Ruggles, Howard E., and Bryan, Lloyd. Bone malignancy from the roentgenological aspect. *Radiology*, July, 1926, vii, 24–28.

At the present time one can recognize with fair accuracy typical examples of the following primary tumors: (1) giant cell tumor; (2) osteogenic sarcoma; (3) undifferentiated osteogenic sarcoma; (4) endothelioma; (5) myeloma. There are many borderline and atypical lesions which are not clean cut either roentgenologically or pathologically.

Giant cell tumors have a characteristic appearance. They present rarefied areas, showing thin-walled trabeculae somewhat suggestive of soap bubbles. There is asymmetrical expansion of the affected region with a tendency to follow into processes and condyles. They extend to the joint cartilage but do not invade it. There is no periosteal reaction unless fracture is present. They are most common in the age period twenty to forty years. Malignant changes are possible but extremely rare.

Osteogenic sarcoma is practically always seen in the distal third when it occurs in long bone. A location in the middle third of the shaft is strong evidence against an osteogenic tumor. These growths appear before thirty, tend to recur locally and produce pain, fever and metastases. Roentgenologically the subperiosteal is the most common form. It begins as an irregular erosion of the cortex with very early elevation of the periosteum and new bone formation at the margin of growth. This is its most important characteristic. In rapidly growing tumors this limiting reaction of the periosteum may be absent. As the process develops the marginal reaction increases, erosion of the cortex becomes more prominent, the medulla is involved and a variable amount of calcification appears in the soft tissue tumor. The medullary form gives an irregular area of rarefaction in the cancellous bone showing no well organized trabeculation within it. Rupture of the cortex and extension into the soft tissues occur easily. Lesions of the flat bones are usually of the medullary type with bone destruction as their predominant feature. In some cases there is an amount of trabeculation which gives them a strong resemblance to giant cell tumors.

Undifferentiated sarcoma is a purely destructive process which takes everything before it. The lesions have fairly sharp irregular margins and there is no trace of bone reaction.

Endothelioma appears in two forms probably depending upon whether it develops from the blood vessels of bone substance or of marrow. In the first form they are similar to osteogenic sarcoma and may be diagnosed as such. They are situated somewhat farther from the ends of the long bones and there is more localized destruction of the cortex. There is usually more periosteal new bone formation which may occur in layers partially or completely surrounding the tumor. The second form produces a mottled or coarsely trabecular structure in the affected bone, somewhat suggestive of osteitis deformans in some cases and of myeloma in others. Usually a considerable portion of the shaft is involved. In the flat bones it may resemble giant cell tumor. The second type may be separated from myeloma by the fact that it is a single lesion and by the absence of albumosuria. Endothelioma does not expand the bone as strikingly as giant cell tumor and the trabeculation is heavier and coarser.

Myeloma appears in multiple foci, always in cancellous bone and is most common in ribs, sternum, vertebrae, skull, femur and pelvis. The tumors are small nodules or large bulky growths, chiefly in males of the fourth and fifth decades. They produce considerable deformity in bone outline due to irregular growth and they usually show coarse trabeculation. Individual lesions in flat bones may resemble giant cell tumors or endotheliomas, but the presence of other lesions will exclude them.

Out of a total of 650 cases of bone sarcoma in the Registry there are 26 per cent of giant cell tumor, 40 per cent osteogenic sarcoma, 10 per cent endothelioma and 2 per cent myeloma.

The authors' material consists of 72 cases of bone malignancy from a total of 220,000 cases, or one case for every 3000 examinations. These are tabulated according to age and localization of the tumor.

Swanberg, Harold, and Montgomery, E. B. Solitary diverticulum of the jejunum. *Radiology*, August, 1926, vii, 144–148.

A report is given of a case occurring in a woman aged fifty-five in whom the solitary diverticulum of the jejunum was diagnosed roentgenologically but not confirmed by operation. The patient had been suffering from periodic vomiting, the cause of which was obscure. The barium meal readily entered the stomach which began to empty at once giving an appearance similar to that in which a large gastroenterostomy has been done. There was a normal gastric contour except on the greater curvature, in its middle part, where there appeared to be a distinct large bulging as if a diverticulum were present. The sacculation was nearly oval, measuring about 6 cm. in its greatest diameter. At six hours the head of the meal was in the transverse colon and a small gastric residue was seen in addition to the above mentioned sacculation which still contained barium. At twenty-four and forty-eight hours barium was scattered throughout the colon but the same sacculation still contained barium. Views from different angles showed that the sacculation was not connected with the stomach but posterior to it presumably of the jejunum.

The roentgenologic findings and the clinical history of acute intestinal obstruction point clearly to a diagnosis of large diverticulum of the beginning portion of the jejunum.

Tartagli, Dino. A case of idiopathic dilatation of the esophagus. *Radiol. med.*, October, 1926, xiii, 711–719.

A case is described in a woman aged sixty in which both the clinical and roentgen signs were typically those of idiopathic dilatation of the esophagus. All the signs of disturbed motility of the esophagus were evident. From the signs in his case the author doubts the reliability of Holzknecht's test and in studying the pathogenetic mechanism of the condition he arrives at a hypothesis similar to Hurst's of achalasia, or defective relaxation, of the cardia. A nervous incoordination, probably due to lesion of vagus filaments, causes a defective relaxation of the cardia. The part of the esophagus above it suffers motor incoordination as a result, and reacts with hyperperistalsis or possibly antiperistalsis. The increased peristaltic contractions cause changes in the delicate wall of the esophagus gradually leading to hypertrophy, but if the primary disturbance persists it will finally exhaust the defensive power of the esophagus whose walls will gradually dilate, with consequent decrease and finally total disappearance of the peristaltic wave. It is in this stage of complete idiopathic dilatation that the patients generally present themselves for treatment.

Turner, George. Actinomycosis of the lungs. *Radiology*, July, 1926, vii, 39–43.

Any continued chest infection in which there is no evidence of tuberculosis should be considered as a possible ray fungus infection and study should be made of the sputum and the roentgenograms with this in mind.

From a roentgenographic point of view there are two types of actinomycosis of the lungs. In one type the infection involves the hilus and extends along the bronchi producing peribronchial infiltration with extensive fibrosis. The extension is more likely to travel downward than upward. The granulomatous masses are miliary in size and very dense along the inner lining of the bronchi. When these granulomas suppurate, expectoration is profuse, usually blood-stained and containing actinomycetes.

The other type of actinomycosis involves the lung tissue proper and presents a picture of abscess. Pleural involvement soon occurs with possible empyema and fistulous tracts through the skin. The infection may begin as a bronchial type and continue as a severe and stubborn bronchitis when a well-defined circumscribed area will appear in the lung tissue. A tendency of the disease is to jump across what appears to be normal tissue. The lesion is more progressive than the usual lung abscess found in tuberculosis or after pneumonia. By making roentgenograms at intervals of about two weeks and comparing them the condition can be differentiated from other forms of lung abscess. Syphilis, malignancy and tuberculosis of the lung should be easily differentiated from actinomycosis. It should be remembered, however, that while actinomycosis presents characteristics peculiar to its own form of lesion, there is nothing sufficiently distinctive roentgenologically to permit a diagnosis from roentgenographic examination alone. A correct diagnosis depends on the close cooperation between roentgenologist, clinical microscopist and clinician.

A report is given of a case occurring in a man aged thirty-eight.

Desjardins, Arthur U. Radiotherapy for lymphoblastoma. *Radiology*, August, 1926, vii, 121–130.

Radiotherapy does not prolong the life of patients suffering from lymphoblastoma. This

does not mean that the treatment does not exert any influence on the disease. It is well known that its clinical manifestations can generally be controlled and that many patients can be restored to a relatively normal state of health for long periods. Massive enlargement of the cervical, axillary and inguinal glands and voluminous mediastinal and retroperitoneal adenopathy can be obliterated. Distressing secondary phenomena such as dyspnea, venous engorgement, toxic pruritus and pleural effusion can often be relieved. Moreover, the reaction of lymphoblastomatous deposits to irradiation is so characteristic as to constitute a valuable therapeutic test when biopsy is not possible.

The above conclusions are drawn from a review of a series of cases receiving more or less systematic treatment with radium or roentgen rays. These include all the patients registered at the Mayo Clinic during the four-year period 1920 to 1923 inclusive. The diagnosis was definitely established by biopsy. There were 57 cases of Hodgkin's disease and 126 of lymphosarcoma. The various statistical aspects of this series of cases are presented in a number of tables.

Ferreri, Giorgio. Radium surgery of malignant tumors of the ethmoid and superior maxillary. *Radiol. med.*, November, 1926, xiii, 804–825.

Ferreri advocates combined radium and surgical treatment of malignant tumors of the superior maxillary. He describes 5 cases in which he partially resected the bones which were invaded and removed the tumor masses, so that the radiant energy could exercise as deep an action as possible on the normal tissues and bring about an intense defense reaction. Two of the cases were epithelioma, one a malignant papilloma, one a cylindroma and one an endothelioma. In one of the patients there was a local recurrence fourteen months later while the others are all entirely cured. The surgical operations were almost two years ago. He thinks it is very important to make a histological examination of the tumor in order to be able to give a rational and accurate radium treatment, as the dose varies depending on the nature and malignancy of the tumor. He thinks that moderate amounts of radium should be used (15 to 25 mg. radium element) which should be left in contact with the tumor for four or five days so that a dosage of 13 to 20 mc. is given. Care should be taken not to exceed 20 to 25 mc. if all danger of necrosis or sequestration of the neighboring parts is to be avoided. He did not see any local or general disturbance in any of his patients.

Herendeen, Ralph E. Diagnosis and results in the radiation treatment of some medullary bone tumors. *Radiology*, August, 1926, vii, 140–143.

In attempting to diagnose bone tumors it is necessary to exclude infection, changes resulting from chronic constitutional disease, atrophy from disuse or pressure as possible causes. The location of the tumor is one of the most important points in the diagnosis of giant cell tumors. Of the conditions least suspected when the diagnosis of giant cell tumor is being considered, and probably more frequent than any other are the osteogenic chondrosarcomas; the next in frequency are the myelomas. Ewing's tumor though medullary in origin seldom has many of the characteristic features of a giant cell tumor. The conditions which simulate it more closely than others are carcinomatous metastases and especially metastases from hypernephroma.

Giant cell tumors, chrondrosarcomas and Ewing's tumor all respond differently and in characteristic ways to radiation therapy. There is probably no bone tumor that shows a more immediate or active response to irradiation than Ewing's tumor. Giant cell tumors following a fairly heavy irradiation show a reaction which reaches its height in three to six weeks. The reaction is characterized by redness, swelling and tenderness—sometimes to such a degree that one may suspect the growth to have taken on marked activity. As time goes on the reaction subsides and the tumor becomes firm to the touch. Roentgenograms made later often demonstrate definitely that the tumor is becoming well calcified.

In the case of chondrosarcomas this reaction to irradiation is uncommon. The tumor responds slowly in comparison to other malignant bone tumors. It may be many weeks before any effect of the treatment is visible along with diminution in the size of the tumor. The pain also slowly disappears and at this time a roentgenogram may demonstrate some attempt at ossification or at bone repair.

Although the author does not recommend pre-operative irradiation in malignant bone tumors as a routine procedure, instances are known where the long-continued use of radiation prior to amputation seemed to be a factor in preventing metastasis to the lungs. In these cases the radiation therapy was followed by the production of much fibrous tissue, complete or partial encapsulation of the tumor by fibrous tissue or bony material, and necrosis or degeneration of large areas of the tumor. Amputation should be limited to those cases in the elderly or middle aged where the location and extent of the tumor is such that regeneration of bone

or rather production following curettage or radiation, will not be sufficient in quantity to restore the limb to usefulness.

It is the belief now at the Memorial Hospital, New York City, as a result of the observation of a large number of giant cell tumors of bone treated by radiation alone during the past five or six years that in most instances the results warrant a trial of radiation therapy before resorting to curettage or amputation.

Holmes, George W., Dresser, Richard and Camp, John D. Lymphoblastoma. *Radiology*, July, 1926, vii, 44–50.

Eight cases of lymphoblastoma of the stomach, with roentgen studies of the gastrointestinal tract are reported. There were observed two more or less distinct types of the disease corresponding with the gross pathology as described in the literature.

In general, the gross manifestations of lymphoblastoma of the stomach may be divided into two types: (1) that in which the gastric involvement is coincident with a generalized involvement of the gastrointestinal tract, and (2) that in which the stomach alone is involved. Either of these types may or may not be associated with peripheral lymph node enlargement.

The roentgen findings were either negative or closely simulated those of gastric carcinoma. Consequently the possibility of the presence of this disease in all atypical cases showing cancer-like deformities should be considered. In some of the cases the peristalsis was not interfered with to the extent generally seen in carcinoma. In the generalized form of the disease, particularly in its early stages, the roentgenological examination may be negative.

The localized type of this disease should respond well to radiation therapy or to a combination of irradiation and surgery.